

Mastering Service with a Master Sheet

MOTOR AGE

Volume XXXVI
Number 2

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Fifteen Cents a Copy
Three Dollars a Year



Prices:
Standard sizes for automobiles, etc., \$1 each;
Tractor Special, \$2 each.

National

TRACTOR SPECIAL BIG STONE INSULATOR

Practically unbreakable — heat-proof — oil-proof — trouble-proof — compression-tight. Equipped with BIG Power—oversize electrodes of extra heavy wire—designed specially to ignite low grade oils that have a tendency to slow, lazy ignition. The NATIONAL Tractor Special—designed to meet the requirements of tractors and high-compression stationary engines—is a BIG Power, sturdy, oversize, dependable plug that stands up under heavy-duty requirements and is unequalled for durability, steady service and economy of fuel.

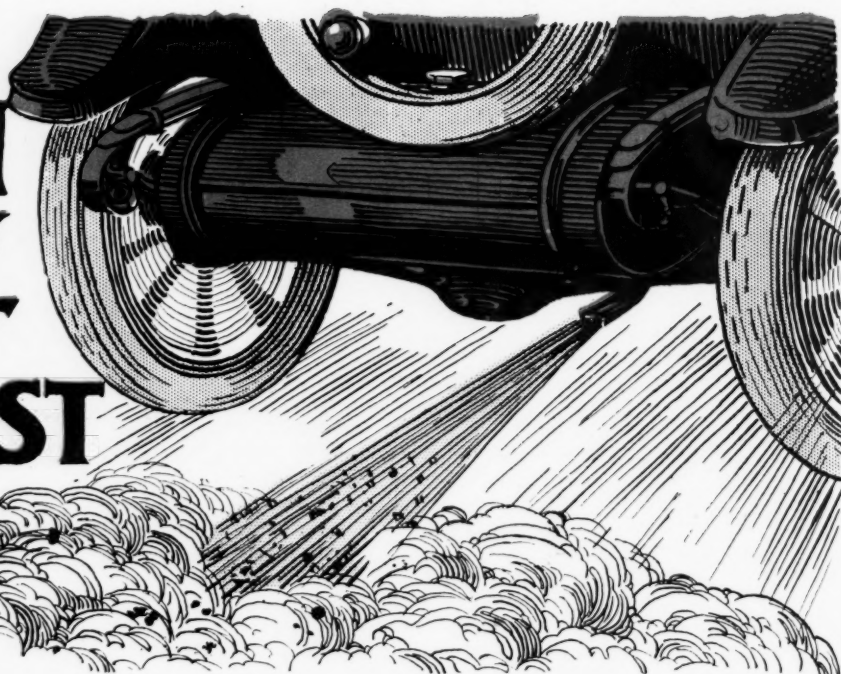
NATIONAL Spark Plugs are made in all sizes—to fit any motor—for every requirement of air, land and water service. Every plug is assembled by hand, carefully inspected and rigidly tested.

Ask your dealer or write for Descriptive Booklet

NATIONAL SPARK PLUG CO., ROCKFORD, ILL.

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REMOVE CARBON THE EASY WAY=OUT THE EXHAUST

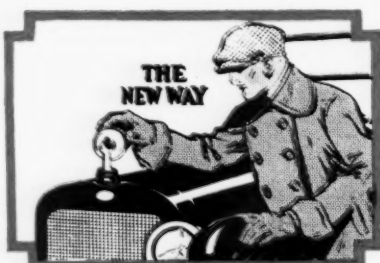


THE easiest, cleanest and most satisfactory method of removing carbon deposits is with Johnson's Carbon Remover. It will save you from \$3.00 to \$5.00 over any other method without laying up your car. After one application your car will run like it did the first 500 miles—quietly and full of “pep”—and you will secure the maximum power and speed from the minimum amount of fuel.

JOHNSON'S CARBON REMOVER

A dose of Johnson's Carbon Remover, the engine laxative, will cure 80% of engine troubles. It will increase the power of your car—improve acceleration—stop that knock—quiet your motor—save your batteries—and cut down your repair bills.

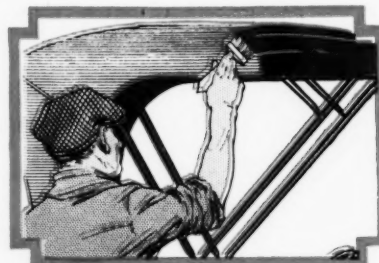
Johnson's Carbon Remover is a perfectly harmless liquid to be poured or squirted into the cylinders. Millions of cans have been used. Recommended by many of the leading car manufacturers, including the Packard and Studebaker Companies.



will stop leaks immediately without laying up the car—no mechanical experience required. It contains nothing which can clog or coat the cooling system and is absolutely harmless in every respect. It isn't a make-shift—it's a permanent repair.



This is the ideal repair for tubes, casings and rubber goods of all kinds. No time, labor or heat required. A Patch can be applied in three minutes and it's so simple a child can use it. Gives equally good results on a pin hole puncture or on a large blowout.



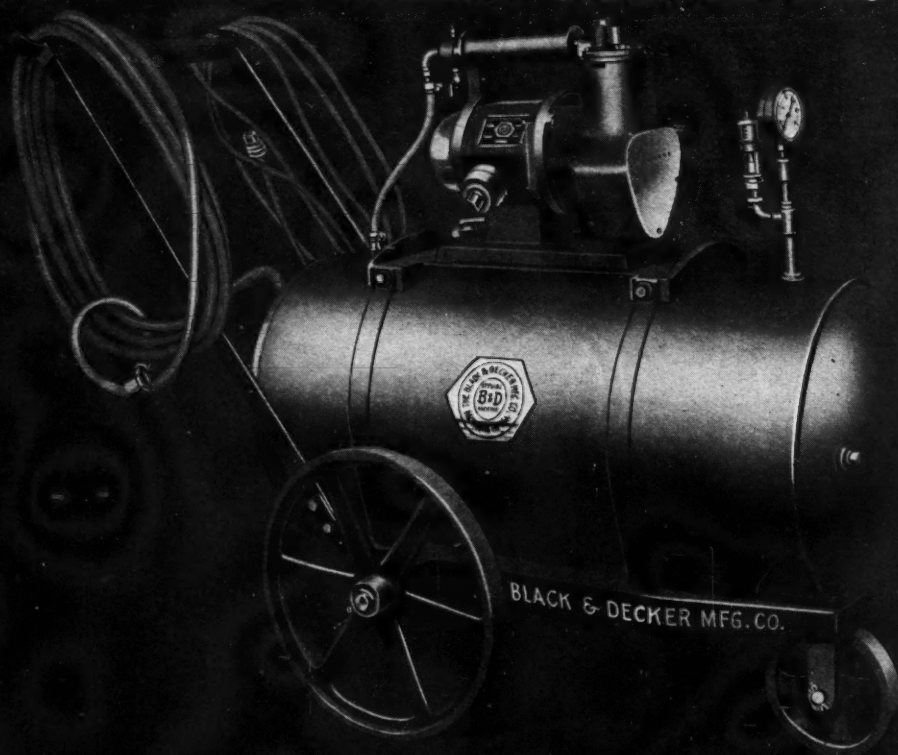
Here is a preparation with which you can make your gray dusty top and side curtains look like new. Johnson's Black-Lac is unequalled for blackening fenders, rims, hoods, lamps—and in fact, all worn metal parts. Prevents rust and keeps your car in a high state of repair.

Write for our booklet on “Keeping Cars Young”—it's free
S. C. JOHNSON & SON, Dept. M. A., Racine, Wis.

BLACK & DECKER

LECTROFLATER

ELECTRIC AIR COMPRESSORS



PORTABLE TANK-OUTFIT

Particularly convenient for use out-doors and places at some distance from the nearest electric light socket, as the tank stores sufficient air at one filling to inflate five average tires from flat to full pressure or ten tires from 40 to 80 pounds. You take the air to the car, saving valuable time and giving your patrons the kind of service they appreciate.

The No. 2 Lectroflater Electric Air Compressor used with this outfit is a sturdy, dependable unit of unusual compactness and durability.

Air cooled. There is no water to freeze up.

Grease lubricated throughout. No oil used.

The motor develops one-half horsepower and operates on any current from Direct to 60 cycle Alternating.

Lectroflaters are made in different styles to suit various requirements.

May we send you complete information?

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Starting—Lighting—Ignition

MOTOR AGE

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E. E. HAIGHT, Manager
DAVID BEECROFT DARWIN S. HATCH
Directing Editor Managing Editor

BRANCH OFFICES

DETROIT, 95 Fort St., W., Phone Main 1351
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your electrical Appara-
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NEW YORK

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AUTOMOBILE DISTRIBUTORS YOUR greatest opportunity!

Learn the real facts about the Motor Truck and Farm Tractor industries. Get the "Power Wagon Reference Book"!

Read what other distributors say about it:

The "Reference Book" covers the field in a broader way, and yet more concretely, than all the miscellaneous publications we have yet seen put together.—Graham Bros. Sales Co., N. Y. City, "Bethlehem" distributor.

We cannot understand how anyone in the automobile business would be without the "Reference Book" constantly on his desk.—Mulford, Haas Co., Brooklyn, "Ford" dealer.

We would not take \$25 for it if we were unable to get another copy.—Shaw Motor Co., Salt Lake City, "F W D" dealer.

It is the best work of its kind published.—Burton Roundtree & Co., Dallas, Texas, "Peerless" and "Master" dealer.

To say it is a masterpiece would be mild; it is simply incomparable.—Sears Automobile Co., Des Moines, Ia.

It is most complete and worthy of being in the hands of every truck selling organization in the country.—Houston Motor Truck Co., Houston, Tex., "Republic" dealer.

We have yet to find any book that gives information in regard to motor trucks in a simpler way.—Eldridge Co., Seattle, Wash., "GMC" dealer.

The "Reference Book" is a tremendous help to us. It is the best publication of its kind ever issued by any publisher.—Packard Motor Car Co. of N. Y., Hartford, Conn.

Some of the data it contains has been instrumental in saving me many times its cost.—F. E. Wadhams, Rockford, Ill.

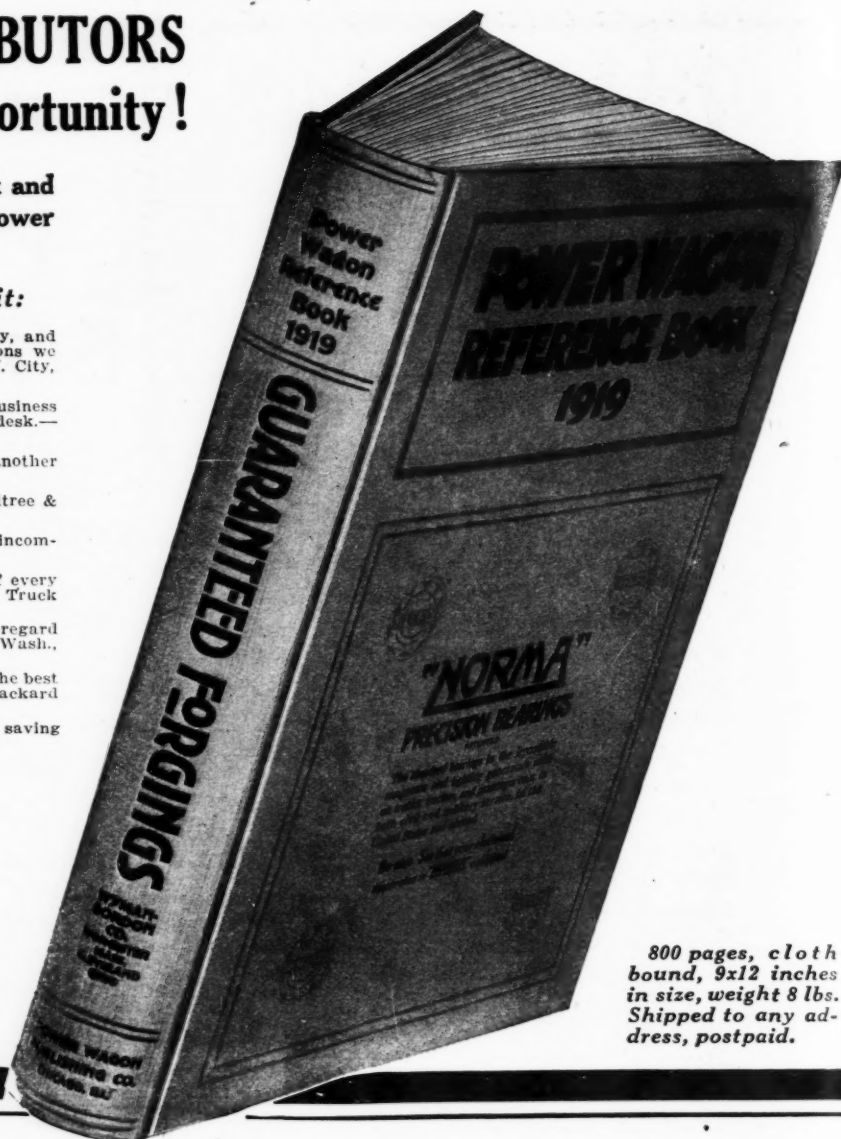
I can truthfully say it is the best \$2.50 investment I ever made.—Fred A. Rademacher, Watertown, S. D.

It certainly is an encyclopaedia of the motor truck business. Every dealer should have one of these books. There is more information in concrete form in it than in any other publication we have seen.—Brockway Motor Truck Co., Baltimore, Md.

It is wonderful. It is the greatest book on the market for truck and tractor dealers and salesmen.—Edgar Eno, Norton, Kan.

In all our experience in the motor truck business we have never seen anything that can compare with it. It is of the greatest assistance.—H. B. Odell, Atlanta, Ga., "Packard" dealer.

We do not see how any dealer can afford to be without it. It is the most complete book of its kind we have been able to get.—Service Truck Co. of Texas, Fort Worth, Tex., "Service" dealer.



800 pages, cloth bound, 9x12 inches in size, weight 8 lbs. Shipped to any address, postpaid.

THIS 800-page Reference Book is an encyclopaedia of Motor Trucks, Trailers, and Farm Tractors—their construction and their varied application in commerce.

It contains 100 pages of specification tables of Motor Trucks, Trailers, Farm Tractors, Engines, Axles, Transmissions, Springs, Frames, etc. The major specifications are kept up to date each month. It presents 91 full-page blue-prints in color of the principal models of Motor Trucks, Trailers, and Tractors on the market.

400 pages are devoted to an encyclopaedic section in which appear studies of the application of motor trucks in the leading industries, with facts about the transportation problems of truck users, costs of operation, and the type of bodies that trucks in the numerous kinds of service require. In addition there are scores of useful tables and other valuable data about the industry. This section alone is illustrated with over 700 instructive drawings and photographs.

SIGN AND MAIL TRIAL COUPON TODAY

THE POWER WAGON PUBLISHING CO.,
542 Lake Shore Drive, Chicago.

Date.....

Please enter my order for one copy of the "Power Wagon Reference Book" and a year's subscription to the "Power Wagon," beginning with the forthcoming issue. Price \$2.50.

It is understood that I shall have the privilege of examining the "Reference Book" for five days after its receipt. If I decide not to keep it, I will return it promptly at your expense and you agree to cancel this order, otherwise I agree immediately to remit the price, \$2.50.

Name

Street address

City State.....

Business

Dealers by the hundreds have written their approval of the helpfulness and the value of "The Power Wagon Reference Book." Every dealer and salesman should have a copy to get an accurate and intelligent picture of what this industry really is. Even though you don't sell trucks you need these facts now!

"The Power Wagon Reference Book" is sent to any address for five days' free examination. Send no money. Simply mail the coupon. The price includes a yearly subscription—12 monthly numbers, to "Power Wagon," an exponent of the most enlightened thought and practice of the Motor Truck Industry—and its oldest trade journal. Each month the "Power Wagon" will keep up to date the major truck specifications published in the "Reference Book," so in the combination you have the most complete news, sales information, and data service that experience and money can produce—and yet it costs you only \$2.50, after you see it and are convinced it is all we claim it to be.

MAKE SURE THAT YOU WILL NOT MISS THIS OPPORTUNITY—CLIP THE COUPON NOW.

THE POWER WAGON PUBLISHING CO., CHICAGO

MASTERING SERVICE PROBLEMS WITH A MASTER SHEET

Whenever a new idea on service appears, it is eagerly sought for by practically everyone in the trade. The Philadelphia representative of MOTOR AGE has had his ears close to the ground and has dug up a brand new one.

Haven't you been looking for an ideal method by which you could base repair estimates and do it systematically? This master service that you are going to read about is an idea simplified. It consists of only seven forms but gives a complete cost and work record. It's a real time saver, too, and reduces office detail to a minimum.

The lead story in this number tells about this master service sheet. Read it carefully; note that each operation of repair work is listed separately and, by a little study and experience, a definite charge can be assigned to each of these operations.

This is simplicity itself and the time you spend in studying this system will be well spent, and perhaps help cast away some of those little business worries.

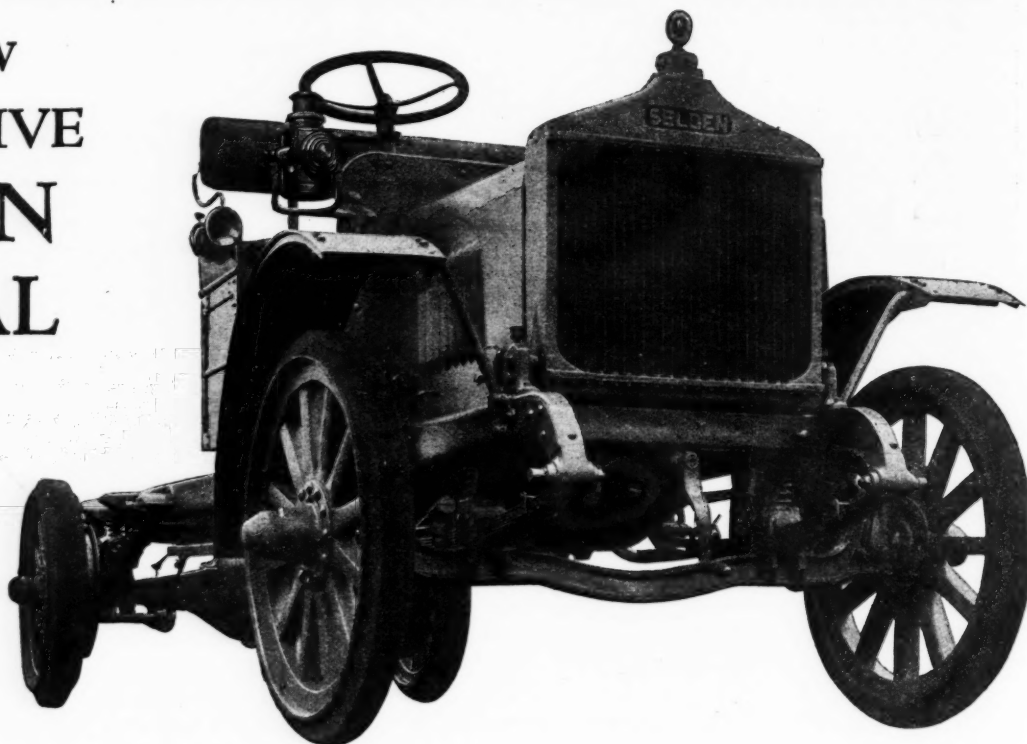
The next and final article on this master sheet service system will appear in next week's number.

NATIONAL TRACTOR DEMONSTRATIONS

MOTOR AGE dealers now handling or contemplating adding tractors will be interested in the preliminary article in this number on the demonstrations to be held at Wichita, Kansas, and especially in the complete story of the demonstrations that will appear in the July 24th number.

The New WORM DRIVE SELDEN SPECIAL

\$2185



ORDERS for the SELDEN SPECIAL Received from Hundreds of Manufacturers, Farmers, Retail Merchants, etc., Express the Judgment of Buyers Well Qualified to Judge a Motor Truck

When we presented the SELDEN SPECIAL Model at \$2185, a month ago, as the truck to meet the present-day need for **HIGH QUALITY CONSTRUCTION** at **MODERATE COST**, we did so with the firm belief that this remarkable achievement in motor truck manufacture would meet with widespread acceptance.

To-day we are gratified to have our judgment substantiated by hundreds of orders for the SELDEN SPECIAL which have come to us from manufacturers, farmers, retail merchants, etc., in all sections of the country.

Widely different kinds of industry are represented in the orders which we have received—which is an indication of the adaptability of the SELDEN SPECIAL to every conceivable kind of a hauling problem requiring a truck of 1½ tons capacity.

Present conditions indicate that sales of the SELDEN SPECIAL will be limited only by the number of trucks which we can build.

The phenomenal and spontaneous demand for this model has produced a flood of calls from our distributors for increased allotments, but by further increasing our manufacturing facilities, we expect to be able to fill all orders promptly.

The Selden Line of **IN-BUILT QUALITY** Motor Trucks comprises models of 1, 1½, 2, 3½ and 5 Ton capacity—all **WORM Drive**.

*Ask us to send you Specifications of the SELDEN SPECIAL—the truck that meets the needs of to-day for **HIGH QUALITY CONSTRUCTION** at **MODERATE COST**.*

*We shall be glad to hear from **DEALERS** desirous of handling **SELDEN TRUCKS** in any territory where they are not at present being sold.*

SELDEN TRUCK SALES COMPANY, Rochester, N.Y., U.S.A.

Selden Motor Trucks

MOTOR AGE

Mastering Service Problems With a Master Sheet

Number System of Indicating Repair Jobs Through Shop Proves a Time-Saver

In Two Parts—Part I

THROUGH the use of a master sheet the Larson-Oldsmobile Co., Philadelphia, Pa., is solving the perplexities of service station and repairshop, simplifying its office system and increasing its list of satisfied customers. The master sheet consists of a sheet listing the seven main units of a motor car and a miscellaneous heading, numbers in varying progressions for each unit being keyed by a statement, under each division, of virtually every conceivable repair that can be made thereto.

Mistakes Are Likely

Every service manager knows there are customers not sufficiently well informed as to the mechanism of a car to be able to tell just what ails it when it needs adjustment or repair. An experienced car owner, sometimes in spite of careful instruction from a salesman, lacking mechanical or technical knowledge of his machine, may make absurd suggestions or give orders impossible to fill or just plainly be mistaken as to the nature and extent of an injury to his car. If a service station is without careful system of checking, a wrong decision may be made as to what work to do on the car through following out the idea of the customer. While, of course, hardly any mechanic will take it for granted the customer knows all about it or will act on a palpably foolish suggestion from the owner, a master sheet bas for a service system has been found especially handy in not having such mistakes go even as far as the first entry.

With a master sheet, if a customer

gives the wrong diagnosis, the service department immediately will check it, find the error and report back to the customer, giving the correct diagnosis from an expert point of view. If a customer does not then wish to take the advice, he is free to withdraw his car, but he knows that he places himself, when ignoring such advice, in the position of the man who seeks a doctor and,

when offered medicine, throws it out of the window.

The use of the master sheet, then, is an immediate check against acting on the presentation of the wrong diagnosis. There can be no erroneous entry on the mechanic's time card, which later would have to be corrected.

These seven units and the heading "miscellaneous," known for a convenience as the eight grand divisions of the master sheet, are as follows:

MOTOR
ELECTRIC SYSTEM
TRANSMISSION AND CLUTCH
UNIVERSALS
DIFFERENTIAL
STEERING GEAR
CHASSIS
MISCELLANEOUS

Easy to Learn

But as the master sheet purposely is so laid out as to be readily learned by heart, unless an employee is new to the plant, he will not need to refer to it.

The type of repair or adjustment to be made under each of the grand divisions is named only on the master sheet, which, as its name would indicate, is the key to the numbers which appear elsewhere in the system.

Under "motor," for instance, the numbers run from 1 to 21, and each of these numbers represents some particular repair or adjustment which can be effected in connection with that particular unit of the car. It is not probable that more than twenty-one kinds of repairs and adjustments can be made on an engine.

Why Is a Master Sheet?

Here are some of the advantages of using a master sheet in service and repair office system:

1—Its proper use eliminates the possibility of making the wrong repair on any unit, or "grand division" of a car—even a dentist sometimes pulls the wrong tooth.

2—It prevents insufficient overhauling of a car when the customer has left it to the service manager to decide on what, or how much is to be done.

3—It greatly facilitates making up the mechanic's time card.

4—It enables the service manager or other person referring to the mechanic's time card to tell readily how much of the work done on a car is "insurance," or "policy" work.

5—It simplifies the system through the elimination of many entries.

6—It is an unanswerable argument to the customer on what has been done on his car and is a preventive of lawsuits.

Under "miscellaneous" might come almost anything to be done on a car not noted under the other grand divisions.

These eight grand divisions, each with a space for a number, from 1 up to its full progression, appear also on the back of the time card used in the system. Again, the grand divisions, but without their numbers, except as checked in with ink or pencil, appear on the repair order. The use of the master sheet is realized perhaps, most quickly by a glance at this repair order when checked or filled in. Then, after each grand division in which there may have been a repair, will appear an inked or penciled number, signifying to the repairman just what is to be done to that unit of the car. By reference to the master sheet, which by the way, appears conspicuously in several places in the departments where employees may see it—usually through a sheet of glass—he will know what is to be done.

It is easy to realize the importance of the master sheet in relation to "insurance" work on a car. It has been said that nine out of every ten "accident jobs" that come to a service station are covered by insurance. After an accident in this category, the insurance adjuster who has been keeping tab on the car may call at the dealer's service department to look over the machine and make his estimate. Without a master sheet basis to help differentiate the hours of work put on a car, showing just what is "insurance" work time, the tendency is to add the "insurance" work to the service station's work for the owner.

The usual procedure means many entries on a card or sheet to make the total the customer must pay. In consequence, there is not only a crowded, unbusiness-like, messy looking card or sheet ordinarily but confusion in the bargain.

With the master sheet, not a host of entries but a few neat numbers appear

on a card, from which, because of the method used, both hours and work easily are ascertained.

The mechanic's time card is made up from the data of the master sheet, the regular maintenance work being so assembled as to be quickly picked out from the insurance work, or vice-versa. On this time card, the hours on each job are itemized, and from them the insurance adjuster can separate the items so as to tell very quickly how much actual working time, was spent on a bent fender, a twisted axle or any other item which he knows at once is the class called insurance work and covered in the policy.

Insurance adjusters naturally like this method, as it saves them much trouble and provides them with a positively accurate account, against which there is no comeback. Often they will take the company's account without question, because they know it is correct and lightens their own work. It takes but a moment

The Master Sheet

MOTOR

- 1—Adjust connecting rod and main shaft bearings—renew as needed
- 2—True up stems, turn valves, ream seats and grind
- 3—Clean crankcase and put in fresh oil
- 4—Adjust timing gears, bearings, bushings and shafts
- 5—Adjust camshaft bearings
- 6—Examine piston rings—renew as needed
- 7—Examine piston pins—renew as needed
- 8—Examine cylinder walls and pistons for scores and wear
- 9—Micrometer pistons and cylinders for clearance
- 10—Repair or renew pistons as needed
- 11—Repair water pump
- 12—Repair oil pump
- 13—*a*—Examine and repair cylinder head, intake and exhaust gaskets
- b*—Examine crankcase, valve cover and oil pump gaskets
- c*—Examine all water inlet and outlet gaskets
- 14—Examine all water hose
- 15—Adjust spark and throttle control
- 16—Adjust or repair oil pressure or sight feed
- 17—Clean outside of engine and paint
- 18—Tighten or renew fan belt
- 19—Adjust valve lifts
- 20—Clean carbon
- 21—Adjust carbureter

ELECTRICAL SYSTEM

- 1—Clean and adjust spark plugs
- 2—Clean distributor—true up in lathe
- 3—Clean and adjust breaker points—renew if needed
- 4—Clean generator and true armature—renew brushes as needed
- 5—Clean starting motor—true armature—renew brushes as needed
- 6—Clean and adjust horn
- 7—Repair or adjust starting motor
- 8—Test storage—fill with distilled water
- 9—Clean and tighten all binding posts and wire terminals
- 10—Focus headlamps—Clean reflectors
- 11—Install bulbs as needed
- 12—Adjust or repair generator to charge correctly
- 13—Install new wiring as needed

TRANSMISSION AND CLUTCH

- 1—Examine clutch leather—Clean and soften as needed
- 2—Lubricate clutch shaft, clutch control levers and clutch collar
- 3—Adjust clutch pedal
- 4—Tighten transmission on gearshift lever
- 5—Renew oil in transmission
- 6—Renew transmission felt washers as needed
- 7—Remedy slipping clutch
- 8—Remedy grabbing clutch

UNIVERSALS

- 1—Renew pins, bushings, yokes, etc.
- 2—Lubricate pins and bushings with heavy oil
- 3—Pack universals with grease
- 4—See that distributor cover is set tight and permanently
- 5—See that universal joint flange bolts are tight and wired
- 6—See that grease plugs are tight

DIFFERENTIAL

- 1—Examine adjustment of differential gears
- 2—See that all differential and pinion bearings are in perfect condition and adjusted properly

- 3—Renew oil in differential
- 4—Lubricate pinion shaft bearings
- 5—Take lost motion out of axleshaft
- 6—Remedy grease leak from rear wheels
- 7—Repair differential

STEERING GEAR

- 1—Adjust steering gear and lubricate
- 2—Adjust and lubricate steering reach and cross rods
- 3—Grease and tighten steering king bolts
- 4—Renew steering king bolts or bushings

CHASSIS

- 1—Examine all wheel bearings—grease and adjust properly
- 2—Line up front wheels
- 3—Grease and tighten all shackle bolts—renew any worn shackles and bolts
- 4—Tighten all spring clips
- 5—Lubricate all brake linkage—remedy any lost motion in clevis pins and rod bushings
- 6—Tighten body bolts
- 7—Tighten engine and bed bolts
- 8—Tighten fender and running board bolts
- 9—Adjust body doors and locks
- 10—Tighten muffler and renew if needed
- 11—Clean gasoline tank and tighten brackets
- 12—Repair gasoline tank
- 13—Repair gasoline gage
- 14—Examine gasoline line and connections
- 15—Clean rust from tire rims and paint with graphite and water mixed
- 16—Adjust and tighten tire rack
- 17—Repair tire rack—renew if needed
- 18—Tighten running board boxes, engine pans, fenders, etc.
- 19—Reline foot brakes
- 20—Reline emergency brakes
- 21—Straighten fender
- 22—Install new fenders
- 23—Repair radiator
- 24—Tighten rim bolts
- 25—Repair springs—renew if needed
- 26—Adjust brakes or repair
- 27—Straighten axles
- 28—Install new gas tank
- 29—Install new or repair emergency brake latch rod

MISCELLANEOUS

- 1—Clean vacuum tank and repair
- 2—Repair carbureter
- 3—Repair top and curtains
- 4—New light in rear curtain
- 5—New top boot
- 6—Repair upholstery
- 7—Renew or replace tonneau carpet
- 8—Recover runningboards
- 9—Recover toe boards
- 10—Repair, tighten and adjust windshield
- 11—New glass in windshield or sedan door
- 12—Repaint car
- 13—Renickel all metal parts
- 14—Testing
- 15—Delivering and teaching—shifting company cars
- 16—Demonstrating
- 17—To freight yards for new cars, checking, greasing, testing, etc.
- 18—Errands
- 19—Dress upholstery and top
- 20—Free up and adjust spark and throttle control housing

WORK ORDER DISTRIBUTION

CUSTOMER'S CHARGES					
SALES AND COST DISTRIBUTION					
	SALES		COSTS		POLICY
Repair Parts					
Outside Repairs					
Repair Dept.					
Gasoline and Oil					
Garage Storage					
Total					

OTHER CHARGES		
INVENTORY DISTRIBUTION		
Repair Parts Inventory		
Outside Inventory		
Repair Dept. Inventory		
Gasoline and Oil Account		
Total		

REPAIR ORDER No. _____
LARSON OLDSMOBILE CO., Inc.

Name _____ Date _____ 19____
Address _____ 'Phone _____

Please make the following repairs to my car, supplying such parts and material as may be required, for which I agree to pay such charges as may accrue:

The classification, names and numbers listed on this sheet indicate repair work as per the master sheet; customers shall see that list is complete and correct before signing.

[illegible]

Foreman will check each number with blue pencil as work proceeds.

To avoid misunderstanding, the Larson Oldsmobile Co., Inc., assumes no liability for loss or damage to the automobile upon which this job ticket is written, its parts, accessories or contents, caused by fire, theft, acts of persons not in the employ of the Larson Oldsmobile Co., Inc., or by causes beyond its control.

ALL REPAIRS ARE C. O. D.

NO ESTIMATES GIVEN

Customer _____
Per _____

Date Wanted _____ Date Completed _____

I have received this day Car No. _____ in apparent good running order and all equipment, tools, etc., which were on this car at the time it was delivered to the Larson Oldsmobile Co., Inc.

Customer _____
Per _____

REPAIR ORDER No. _____

This ticket is issued for the purpose of identification and must be presented when taking delivery of car which has been repaired by us, as per your instructions on repair order bearing the number of this ticket.

ALL REPAIRS ARE C. O. D.

NO ESTIMATES GIVEN

Front and back of repair, or work, order for the more difficult jobs. On this appear the names of the eight grand divisions of the master sheet, numbers to be placed in the columns on the left indicating just what work is to be done. Note the detachable stub at the bottom, to be given to the customer

for an adjuster to copy an account and he is able to draw his fee with less work than the old digging process

Under this plan, also, the customer inclined to press matters to the limit—they're rare, but they do happen now and then—hasn't a leg to stand on. In case of a court action, the master sheet system of the service station would hold as good as the evidence from a complete bookkeeping set.

Favored by Customer

The system, though, appears to be a favorite with the customer, as it shows him what's what fairly, squarely, immediately and irrefutably. The mechanic likes it because it lays out his work for him without possibility of annoying errors and having to do work over again, or shift it from one division to another through mistaken entries. And the service manager likes it, because it's efficient. So everybody's happy.

As a reminder and reference, should it be needed by a new employee, copies are placed on the first floor in the serv-

ice station, in the mezzanine, for the force in the service manager's office and in the shop.

CAR THEFTS IN FRANCE

Paris, June 18—Perfectly new American army Cadillac cars have been sold in France for \$300. Fords which have never seen service have been disposed of for \$100 each. These cars were handed to the clients in their boxes, just as they came off the steamer. Unfortunately for the bargain hunters, no more machines can be secured at these advantageous prices, for the officer who organized the sales is now on his way back to the United States, and according to the judgment rendered by general court martial will not be demobilized for fifteen years. The happy Frenchmen who secured a 1919 Cadillac for \$300 are now minus the Cadillac and the dollars.

In addition to this organized theft inside the service, there has been an epidemic of car stealing throughout France. In the advanced zone a group of twenty

officers has been formed for the sole purpose of tracing missing army cars. During the last month they have averaged three finds a day. In the great majority of cases these cars had been abandoned by the roadside owing to breakdown, and had been collected by economically-minded Frenchmen. They were stored away in old barns and in some cases artfully hidden under hayricks until an opportunity presented itself for repairing them and offering them for sale.

Change With Peace

When the drivers came back and found the cars gone, they usually did not trouble very much, being under the impression that the machine had been towed home by some other organization and that it would be reported within a few days. During the active war period, when civilians could not drive cars, there was no danger of theft. Now that motor travel is practically free from restrictions, this carelessness generally means the loss of a machine. Any car left unattended by the roadside or in the street is likely to disappear.

British Dirigible Crosses Atlantic Ocean

Also Makes the Longest Air Flight in History — Trip Takes 108 Hours

CHICAGO, July 7—Add to the feats of the NC4 and the Vickers-Vimy that of the British dirigible R-34, which reached Roosevelt field, Mineola, L. I., at 9:54 yesterday morning, completing the first flight of a lighter-than-air craft across the Atlantic. Incidentally, this was the longest air trip in history, 3200 miles in actual distance covered, more when considering the distance of 3690 miles from East Fortune, near Edinburgh, Scotland, to Trinity Bay, Newfoundland, and 1944 miles from there to Mineola.

Although there was some fear at the last that the dirigible's supply of fuel would give out and it would have to land farther north on the coast, this failure did not materialize. The big airship brought thirty-one persons, among them a representative of the United States navy, Lieut. Com. Zachary Lansdowne; a stowaway, and a cat. About 10,000 persons saw the ship's arrival at Mineola. It required 600 workmen to tie down the great gas bag.

The time consumed in the flight was a few minutes more than 108 hr. Maj. G. H. Scott was in command. The R-34 will make the return trip to England, and it is expected that it will start tomorrow morning, flying over New York and perhaps other eastern cities before leaving the shores of this country.

TO MAKE CROSS-COUNTRY FLIGHT

Washington, July 5—Four DeHaviland battleplanes with Liberty engines will make a flight from Ellington Field, Houston, Tex., to the Pacific coast and then east to the Atlantic coast, with a return trip to Ellington field. The flight will be made soon and practically all the more important cities will be visited enroute.

SEEK RECRUITS FOR AIR SERVICE

Washington, July 5—The Air Service is seeking 15,000 recruits between the ages of eighteen and forty and is particularly desirous of securing electricians, aviation mechanics, engine makers, propeller makers, magneto repairmen, fabric workers, etc. Applicants can address Capt. Charles J. Glidden, Air Service, U. S. Army, Washington, D. C.

MAIL DELIVERY SPEEDS UP

Chicago, July 4—New York mail was delivered to Chicago in 9 hr. this week, thereby inaugurating the daily air service between these two cities. The trip was run on three relays, the lapsed time being 8 hr. 43 min. Through air mail service from New York to Chicago is expected to advance the delivery of mail for Seattle, San Francisco, Los Angeles and other western cities 24 hr. and vice versa.

Air mail from the west for New York and points east is taken on at Chicago

and Cleveland. A plane leaves Chicago at 2:30 p. m., arriving at Cleveland at 5:30 p. m., in time to connect with the Twentieth Century limited, and the mail arrives in New York about 9 o'clock the next morning.

The air mail route between New York and Cleveland was connected with the system from Cleveland to Chicago. A fast flight was made on the first journey when 110 m.p.h. were averaged for a distance of 430 miles. The planes stop at Belfont, Pa., from which point another plane takes the mail to Cleveland. Mail now can be sent by airplane from New York, leaving at 5 a. m. and reaching Chicago at 1 p. m. About 13,000 letters a day are being taken for Pacific coast points and are being advanced 24 hr. by the air mail to Chicago. Likewise air mail from the west for New York is taken on in Chicago and Cleveland and advances the mail many hours over the through train service. Most of the planes used are remodeled DeHaviland fours with Liberty engines and with capacity for 400 lb. of mail each.

Air mail service from Chicago to Omaha, Neb., and St. Louis, Mo., is planned to commence this fall. It is expected this service will reduce mail delivery between the Atlantic and Pacific coasts 16 to 24 hr. Consecutive trips of 325 miles have been made between Cleveland and Chicago without delays, forced landings or engine trouble of any sort. The flights have been made in weather which a short time ago would have been regarded prohibitive. The planes carry 400 lb. of letter mail daily, and as letters range from 40 to 45 a lb., this means that 16,000 letters were transported on each trip. Notwithstanding the weather and the heavy loads, the postal planes which

are the L. W. F.-DeHavilands, equipped with Liberty engines, maintain an average speed of 98.5 m.p.h. Twelve of the L. W. F.-DeHavilands are in the Cleveland service, four being stationed at each terminal and four at Bryan.

The service shows some interesting time results. Short as this link is in comparison with a transcontinental line, Pacific Coast mail is even now advanced 16 hr. to Boston and New England points. The reason is that, by speeding up a few hours at a vital point, the mail reaches its destination in time for afternoon delivery instead of the following morning. Pacific Coast mail, routed via airplane link, is delivered in New York in the morning instead of the afternoon.

Toledo and Detroit are to have daily aerial mail service. Plans are being worked out by the Postoffice Department and aerial mail stamps soon are to be placed on sale in Toledo and Detroit. The proposed air route is to start at Detroit, go to Toledo and from there to Chicago. The aerial postage will be 6 cents a letter.

REGULATES USED CAR SALES

Philadelphia, Pa., July 5—The two motor vehicle regulation bills have been approved. One is a code governing the licensing and operation of all motor vehicles, and the other regulates the sale and transfer of used cars. Both are effective at once.

The state highway department is charged with the enforcement of the laws' provisions. The new registration fees are effective Jan. 1. The code allows a speed of 30 m. p. h. on open roads and 15 in built-up communities. Use of cut-outs is forbidden.

The registration fees for cars are to be 40 cents a horsepower, with a minimum of \$10.

Trucks are licensed according to weight from \$20 to \$150, the latter being for 10,000 lb. Truck lengths are limited to 28 ft., and width to 90 in.; weight to 28,000 lb. Trucks are limited to speed by classes, ranging from 10 m. p. h. for



The British R-34, the first dirigible to cross the Atlantic

heavy grades to 20 for lighter grades. Sworn statements that applicants for licenses are physically able to operate cars are required when applications are made for license, certain qualifications as to vision, hearing and use of hands being necessary. Authority to require special examination is given.

The code contains penalties for destruction of identifying marks and requires records to be kept by garage owners of cars left for storage or repair. Trucks with licenses of other states may run in this state once a week.

The used car law requires complete description, the bills of sale, statements as to ownership and changes made in the car, all to be sworn, one copy to be filed with the state highway commissioner and one to the chief of police, or clerk of quarter sessions court. Operation is forbidden until such statement is filed when a car is sold.

70 PER CENT ON CARS TO FRANCE

Washington, July 5—The tariff on cars imported from the United States to France continues at 70 per cent for all cars and trucks weighing less than 5500 lb. and is 20 per cent for all weighing more than 5500 lb. This information is the result of an interpretation of the official text of the new French revenue laws just received by the Department of Commerce. The text provides for a surtax of 20 per cent on cars weighing more than 2500 kilos, or 5500 lb., 20 per cent on all farm tractors, 10 per cent on all other tractors and 15 per cent on motorcycles. As no mention is made in the text of parts, tires or cars weighing less than 2500 kilos, Department of Commerce officials assume the 70 per cent ad valorem rate continues.

ANDERSON GOES TO ENGLAND

New York, July 5—Resignation of Sir Percival Perry as head of the Ford interests in Great Britain has been followed by appointment of an American to the place, it was learned here to-day. The new director is Warren C. Anderson, known throughout the industry as "Fuzzy" Anderson, who has been in the Ford service many years, twelve or more as manager in St. Louis and the last year in charge of the Chicago office.

Sir Perry, according to Ford headquarters here, will remain with the British organization in charge of the Fordson tractor work, to which he gave much time during the war, promoting its use generally and through the food production department of the government.

TESTING SAVEOLD PROCESS TIRES

Chicago, July 7—A 3500-mile road test of tires rebuilt from discarded casing under the new Saveold process started last week from the Chicago Automobile Club. The test is under the supervision of F. E. Edwards, chairman of the club technical committee, and will terminate with a Chicago-to-New York run. It is designed to throw light on the Saveold Tire Corp.'s claim that \$200,000,000 worth of old tires is being wasted in the United States annually.

13,790 Army Motors for Road Work

Trucks, Cars and Tractors Distributed by War Department Among States

WASHINGTON, July 7—In all 11,751 Army trucks valued by the War Department at \$33,432,390 and 414 tractors 550 miscellaneous touring cars and 1075 Fords have been turned over by the War Department to the Department of Agriculture and in turn distributed to various state highway departments for use in the construction and maintenance of highways throughout the United States.

Fourth allotment of several thousand trucks, cars and tractors will be made shortly. The trucks are of twenty-four types and sizes, including 1½-ton Springfield light aviation, 2-ton Federal, International, Nash, Quads, Denby, Kelly-Springfield, Moreland, Selden and Wilson, 2½-ton Mack, 3-ton heavy-aviation Denby, Federal, Gramm-Bernstein, Peerless, Republic, Standard, Velie and White, 3½-ton Kelly-Springfield and 5-ton Holt, fifty-three 15-ton Holt, twenty-nine Gray and twenty Cleveland tractors.

Miscellaneous touring cars comprised more than twenty different makes. Texas received the most trucks, taking 699. Illinois, the most tractors, taking ninety-nine, Texas, the most touring cars, taking thirty and the most Fords, receiving fifty-eight. Illinois received 523 trucks, ninety-nine 20-ton caterpillar tractors, twenty-two touring cars and forty-four Fords; Iowa, 345 trucks, ten Gray tractors, fifteen touring cars, and twenty-nine Fords. California received 361 trucks, fifteen touring cars and thirty Fords.

These trucks, cars and tractors are being distributed by authority of legislation passed last spring by Congress, authorizing the War Department to turn over road-building and other equipment, including trucks and tractors to the Departments of Treasury, Postoffice and Agriculture. The Department of Agriculture allocates the equipment to the various states according to demands and requirements, allowing the states to use the equipment directly or to lend it to contractors at reasonable rates.

TO INVESTIGATE AUTOMOTIVE STOCKS

Washington, July 5—Investigations of the amount of gasoline held by the War Department and price paid for it and of the numbers of cars, trucks, tractors and other automotive material considered surplus and to be disposed of, are to be made by Congress. One resolution directs the Secretary of War to report the amount of gasoline in storage or under contract, with price to be paid for it and inquires into the contemplated disposition of it. A second resolution directs the Secretary of Agriculture to report to the Senate the number of cars and trucks received from the War Department, with a description of their disposition. The Secretary of War is asked in a third resolution to report to the Senate the

number and description of cars, trucks, tractors and other war material on hand and not needed, with an explanation of the inventory and disposition.

NEW YORK IMPROVES ROADS

Buffalo, July 5—Since April 9, New York has authorized the expenditure of more than \$9,000,000 for highway improvement and repair work, according to a report of the highway commissioner. Forty-nine contracts authorizing the building of 176.36 miles of new roads at a cost of \$4,255,744 have been awarded. There were fifty-four reconstruction contracts for 127.71 miles of road, amounting to \$1,900,164. In addition there is being expended for general repairs to highways \$3,282,759.

ST. LOUIS LIMITS PARKING

St. Louis, Mo., July 5—An ordinance now before the mayor for his signature reduces the period of parking in the congested district to an hour. The mayor has recommended that before he signs the bill the police obtain locks and clamp one on a wheel when the time has expired. It would be necessary then for the owner to go to a police station to get his car unlocked, and then he would be arrested.

A delegation from the Motor Accessories Trade Association has protested to the director of streets that the ordinance requiring diffusing lenses on motor car headlights to remove the glare is not being enforced.

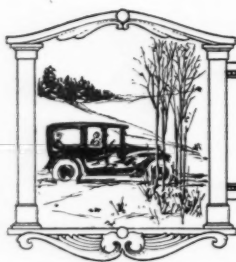
TO REVIVE RACE AROUND SICILY

Paris, June 20—A race around the island of Sicily for the Targa Florio is announced for this fall. Before the war this was one of the classical European races. Chevalier V. Florio, the donor of the cup and the organizer of the race, announces that he hopes to revive this event during the present year on a short course about 60 miles around, which will be covered four times by all classes of cars. As this race will be run only a few weeks before the shows open in Europe it is believed it will attract considerable attention.

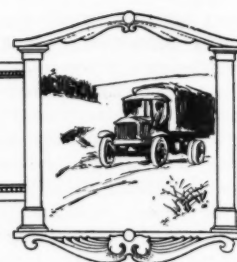
In addition to this race there will be a hydroairplane race around the island of Sicily at about the same time. The Italian government has promised its assistance in every possible way.

RELIABILITY RUNS REVIVED

St. Louis, Mo., July 5—The Automobile Club of St. Louis has decided to revive the annual reliability tours, and the touring committee has been authorized to proceed with arrangements for a 1919 tour, which will include DeSoto, Arcadia, Ste. Genevieve, Jackson, Cape Girardeau and return.



EDITORIAL



Repair Estimates and the Master Sheet

EVERY live service manager favors repair estimates. He does so because it saves arguments and customers. Many who like this idea never have put it into practice. There is a definite reason for this. They never have had a concrete basis upon which to work out the costs of repair operations. That has been the great drawback.

IN this issue appears "Mastering Service Problems with a Master Sheet." A car is divided up into eight grand working divisions. The repair operations possible in each of these divisions are separated individually. By this it is possible to classify repair work and study the cost of doing each job. With experience it is possible to assign a definite charge.

OFTIMES an estimate is not an estimate. To be valuable it should be definite. "About" is a poor word to use in modern business. To quote a repair job as being about \$25 is a service fallacy. Be definite, if you would be sure. "The cost of this job will not exceed \$25," is proper. It leaves no loopholes. There is no chance for a misunderstanding. Each job should be a contract.

THE story referred to has all of these possibilities. Its fundamentals yield itself readily to such a change. It is the culmination of an excellent idea. An idea to eliminate needless red tape in a service system. It is one well worthy of consideration.

Service Lessons from Racing

COULD service managers, shop foremen, mechanics, in fact, anyone associated with a repairshop or service station get into the pits of a well-organized racing team during a race and watch the proceedings, it is more than likely they would see very fine examples of how service can be speeded up. Of course, no one expects the owner of a car to stand impatiently beside his machine coaxing the utmost out of the men making the repairs, for this is not necessary in the ordinary routine of owning and operating a car. The point we wish to make is that a lot can be learned in the way of going about making a repair or adjustment from racing men that applies, perhaps in a more or less modified form, to a repairshop.

A WELL-EQUIPPED and efficient racing outfit will have its tools right, for one thing, that is, the working ends of the wrenches, for example, are not rounded over, the screwdriver points are filed to just the right working condition, hammer handles are not loose, the tools are neatly laid out and segregated so that the wrong ones are not handed the driver or mechanic when a certain job is to be done. They know a certain set of wrenches is necessary to remove the valve chamber plates, say.

HOW often we see cases where the mechanic has to make several trips back and forth to the bench or some other part of the shop to get this or that tool. Especially where service is rendered on but one make of car, there is little excuse why the mechanics should not readily become familiar with just what wrench will take this or that nut. Where an owner drives up to the curb and asks for a man to look over his engine it is quite impressive when the repairman comes out equipped with a set of tools he knows he will be likely to need and can place his fingers right on the particular wrench to to his work, to say nothing of the time saved.

THE advice we wish to impart to repairmen generally is to get so acquainted with the various repair jobs that before the work is tackled the exact tools and other apparatus needed for the job are laid out, so no false moves have to be made in looking around for others. Racing men often make certain pieces of apparatus to speed up the work, and there are many instances where work can be speeded up in service stations by employing a little inventive genius. Even if it takes a few hours to make a tool, if that tool will save several minutes on a job, in a few weeks it will have paid for itself twice over.

Bridging the Atlantic

EVEN a cat may look at a king, and it seems true also that even a cat may sail the skies these days. For on the R-34 as it sailed on the first transatlantic flight of a lighter-than-air ship a tortoise-shell cat shared space with a stowaway and a sixteen-year-old boy formed one of a party of thirty-one. Yet some people will believe all romance is dead, wonders have ceased, aviation is tomfoolery and ships that pass by night will never be those of other than terrestrial regions. To-day, however, the Atlantic is bridged a third time and motor transportation of the air as well as of the land and sea is nearer.

IT has been felt for some time that the crossing of the Atlantic by a lighter-than-air ship was not only possible but practicable. This has been proved in the successful voyage of the British dirigible R-34 from Scotland to the

United States, and the everyday practice of commercial service via the air has been brought that much closer. Commercial air flights no longer are a part of day-dreams of the future. They are just around the bend of to-morrow. It is well to think on this in these days of automotive returning to peacetime production, when the prospects for further motorization of transportation, given time for the factories to strike their full stride—and also time for needed highway improvement—are so glowing.

THE path of international commercial aviation has been blazed. The coming of such traffic has been heralded across the waters by the pioneers NC4, Vickers-Vimy and R-34. The larger airship, the larger plane will make of the path of to-day a broad highway of closely allied international commerce to-morrow.

Capital Trucks Parade

Trade and Motor Corps Stage
3-Mile Long Event at
Washington

Dealers, Owners and Government
Operators

WASHINGTON, July 4—A motor truck transportation demonstration in the form of a parade more than 3 miles long was held here last week when 304 trucks formed under the direction of the Washington Automotive Trade Association and the Motor Transport Corps. The trucks were of all types and descriptions, from light delivery to heavy Army vehicles, and many were decorated with exhibits portraying various businesses and Army activities. As the result of widespread publicity through the press and advertisements in the daily papers by the trade association, the parade was regarded as an unusual event and as unquestionably emphasizing the importance and utility of trucks in Washington and vicinity. Brig. Gen. C. B. Drake, chief of the Motor Transport Corps, was the grand marshal and led the parade, which included the complete

Army truck corps that will make the journey from Washington to San Francisco beginning July 7.

Truck dealers, owners and Government and municipal truck operators entered the parade and attempted to win the prizes for exhibits. These included the best arrangement of owner's business, business principle or business motto, for which the owner's prize was \$100 and the driver's \$20. The owner having the most trucks in line, the best decorated truck, the most interesting Government owned truck or tractor exhibited and the truck creating the most enthusiasm or comment received prizes ranging from \$10 to \$100.

Merchants were told the chief idea for their entries was the advertisement of their own business showing the value of trucks and truck delivery in any kind of business. This resulted in a wide variety of trucks and exhibits. All the truck dealers in Washington joined the parade, together with many tire and parts dealers, the Autocar and Packard companies each having thirty-nine trucks in line and others, including the Grant, Oldsmobile, Mack and Nash, formed the parade. Several German trucks were included. Fire department trucks added to the general interest and the Army motor repair units showed how the Motor Transport Corps is prepared to care for itself on its journey overland.

Truck Train Now Off!

Transcontinental Train Begins
First Trip from Coast
to Coast

To Demonstrate Motors and Help
Recruiting

WASHINGTON, July 7—Special telegram—The first transcontinental motor truck journey started to-day when sixty Army trucks departed from here, following dedication of milestone in which various highway and army officials and members of the automotive industries participated. The truck train is to be self-sustained and self-maintained, carrying sufficient food, repairs and road and bridge-building equipment so that it can proceed without assistance from outside sources.

Fifty-five Stops

The train will make fifty-five stops and expects to reach the Pacific coast Sept. 1. Observers of every branch of the Army will study road conditions. The train which is intended to boost recruiting as well as demonstrate motor transportation and the need for good roads.

The milestone, which was dedicated below the White House, is known as Zero milestone, and it is proposed that all highway mileage in the United States be computed from this point. A temporary duplicate of the granite stone which eventually will be placed on the site was used to-day, awaiting return of President Wilson, who will make an official dedication personally.

Two truck companies, comprising 200 men and officers, and one detachment of engineers of thirty men and two officers, with one medical detachment, one field artillery detachment and representatives of the coast artillery and air service comprise the personnel. H. C. Osterman, vice-president of the Lincoln Highway Association will travel in the pilot car from two to ten days ahead of the convoy.

Makeup of Companies

The convoy equipment includes two companies, Company A comprising one Dodge car, one White passenger, one heavy ambulance, one Harley-Davidson solo motorcycle, two Harley-Davidson sidecar motorcycles, three Mack, three Riker, three F-W-D, three Packard trucks, three Standard B, one 3-ton White, two light delivery Dodge and one machine shop truck. There will be included one kitchen trailer and one tank truck. Company B includes one Dodge, one Cadillac and one White, one heavy ambulance, one Indian solo motorcycle and two Indian sidecar motorcycles. The truck equipment comprises six 1½-ton White, 2½-ton G. M. C., seven 3-ton Standard B, two light delivery Dodge, one tank, two water tanks, one engineering shop, one office work and one search-light truck, with a kitchen trailer.



Part of the parade and spectators of Washington truck parade

Bill Specifies 3% Tax on Chassis

Would Make Sure Higher Levy Did Not Apply — Repeal Asked Also

WASHINGTON, July 5—To insure truck chassis will only be taxed 3 per cent a bill has been introduced in Congress which amends section 900 of the Revenue Act to specifically place a 3 per cent tax on chassis and trucks. The bill includes the original paragraph 1 of section 900 of the Revenue Act, but includes the words "and chassis thereof." Following is the bill which has been referred to the Ways and Means Committee:

"Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, that paragraph 1 of section 900 of an act entitled 'an act to provide revenue, and for other purposes' approved Feb. 24, 1919, be amended to read as follows:

"Automobile trucks, automobile wagons, and chassis thereof (including tires, inner tubes, parts and accessories therefor, sold on or in connection therewith or with the sale thereof) 3 per centum."

Coincident with this the National Automobile Chamber of Commerce announced that resolutions had been adopted and forwarded to members of Congress urging repeal of the special levy on all classes of automotive products.

In its petition for the repeal of the automobile taxation clauses, as a whole, the N. A. C. C. terms the measure discriminatory, through the fact that similar assessments are not laid upon manufactured articles generally. Quoting the recommendation of President Wilson in his message to Congress in favor of the elimination of the taxes, the association declared that the levies were burdensome on the industry in its efforts to resume operation on a peace basis.

TRACTOR ENGINE COMPANY ORGANIZED

Petersburg, Ill., July 5—The W. A. Carrell Motor Co. has been organized to manufacture engines for tractors and other motor vehicles. Some of the models will be exhibited at the Wichita tractor demonstration. C. W. Shipley is president and the other officers are: Vice-president, W. A. Carrell; secretary-treasurer, W. Y. Ramsey. A plant site has been selected and buildings are expected to be erected this summer.

DEALERS MUST REPORT SALES

St. Louis, Mo., July 5—A blank form has been sent out by the state department for dealers to fill monthly, giving the number of new cars they have sold, the persons to whom sold, their address, name of vehicle and horsepower.

In addition to reporting the sale of new cars, dealers must register the transfer of used cars under the provisions of a bill passed by the last legislature, which is now in effect and being

enforced. This law provides that to make the sale of a used car legal both the buyer and seller must indorse a certificate of registration before a notary public. This must be delivered to the purchaser as his evidence of ownership and recorded in the office of the secretary of state. Otherwise such sale is void, and both parties are liable to a fine not to exceed \$50, half of which goes to the informer, except a public official, and the other half to the public school fund. The purpose of the law is to reduce thefts.

Milwaukee, Wis., July 7—Important changes affecting the registration of motor vehicles in the hands of manufacturers, distributors, dealers and sub-dealers in Wisconsin are provided in the new law, effective Jan. 1, 1920. The law gives the industry and trade of Wisconsin relief from the provisions of the section enacted in 1917, which contains many inconsistencies.

One of the most important provisions of the new law is that requiring every manufacturer or dealer in motor vehicles in Wisconsin to make a monthly report to the secretary of state, showing this information: Date of sale of each motor vehicle sold, date of delivery of same, the name and address of the party to whom sold, maker's number of motor vehicle, engine number, style of vehicle, motive power, horsepower, new or used motor vehicle.

RELIABLE ENGINE INCORPORATED

Portsmouth, Ohio, July 5—The Reliable Tractor & Engine Co., formerly the Reliable Engine Co., has been incorporated for \$2,000,000 by C. Heer, F. E. Adams, George W. Platt, F. N. Tynes and M. Heer. The company has been making the Reliable 10-20 tractor and two-cylinder opposed stationary and portable engines in a limited way. With increased capital it is expected to launch these models more extensively.

BAY STATE CARS INCREASE

Boston, Mass., July 5—During the first six months of this year 8645 more plates were issued than during the entire twelve months of last year. A year ago 142,600 registrations had been issued; June 30, 151,245 sets of plates. Commercial vehicles figure in the increase. During 1918 33,053 were registered. Up to last Tuesday there were 35,321, an increase of 3268.

The number of dealers registered this year show a falling off. In 1918 there were 2509, while this year there were 2345 up to July 1, a decrease of 164. For the first six months of last year there were 2432, or 87 more than the present half year. That is easily explained. In past years dealers' numbers

were issued to dealers, both new and used car firms, garages and a lot of mercantile firms and to individuals who were not strictly sellers of motor vehicles. This year the highway commission changed all this. So many men and firms who in the past were running their vehicles on dealer numbers were deprived of this privilege. They have had to accept the classification of their proper sphere.

Last year the owners paid the state \$2,184,408.37. For the six months this year they have turned in \$2,151,922.13. For January to July inclusive in 1918 Massachusetts collected but \$1,843,595.74, or \$308,326.39 less than this year.

In the total figures of a year ago are included, it is believed, the fines, but these are not computed in the six months' figures of this year. Deducting them from the 1918 figures would put the receipts to date ahead of all last year.

Present indications point to a registration of about 165,000 or 170,000 cars and some 40,000 trucks. This will run the receipts for 1919 to at least \$2,600,000.

DUPONT TO MAKE CAR

Wilmington, Del., July 7—The duPont Motor Mfg. Corp. has been formed here, with E. Paul duPont as president, to build motor cars. Incidentally this concern has no connection with what are generally known as "duPont interests" and which control General Motors. E. Paul duPont is associated with the Ball Grain Explosive Co., of which Alfred I. duPont is president, and is president of the Delaware Marine Motors Co. here. Arthur M. Maris, vice-president and general manager of the duPont Motor Mfg. Corp., was with the Biddle Motor Car Co. of Philadelphia until he went to war in 1917. John A. Pierson, chief engineer, was formerly with the Wright-Martin Co.

The first car is to be a four-cylinder, in which it is said the best foreign and domestic ideas will be embodied. It is hoped to have it ready for the next New York show. A six-cylinder may follow.

GILE TRACTOR CHANGES NAME

Ludington, Mich., July 5—The Gile Tractor & Engine Co. has changed its name to the Stearns Motor Mfg. Co. It has a new tractor engine with a bore and stroke of 4 1/4 and 5 by 6 1/2 in. H. P. Wollensak, formerly with the Wisconsin Motor Mfg. Co. as sales and advertising manager and at one time chief engineer of the Beaver Mfg. Co., is general manager, while H. F. Hoesterman, formerly production engineer of the Sterling Motor Truck Co., is factory manager.

MILWAUKEE OBSERVES HOLIDAYS

Milwaukee, Wis., July 7—Every garage, salesroom and repairshop in the downtown district of Milwaukee, and nearly every one in the outlying sections, was closed July 4, 5 and 6. A special meeting was held by the Milwaukee Automobile Dealers, Inc., to adopt this regulation, and repairmen generally fell in line.

After the three-day interruption, the

rush for cars was resumed to-day. Despite the rather disappointing situation arising out of the inability of factories and distributors to make prompt deliveries, largely because of the overwhelming demand at this time, buyers continue to clamor for cars. The waiting list, which was an unknown quantity a year ago, is an established adjunct of nearly every salesroom and growing every day.

Activity in the general automotive field is not confined to the rush for cars. Makers of cars, trucks, parts, equipment, etc., are being rushed as probably never before. There have been some slight outcroppings of labor trouble at Milwaukee, but disputes have found rapid settlement and production has not suffered material interruption.

LOCOMOBILE APPOINTMENTS

Bridgeport, Conn., July 8—Special telegram—J. Murray Page has been appointed western district manager of the Locomobile Co. of America. Clinton B. Amorous, recently major, is now Chicago manager. Both are old Locomobile men. K. W. Florida, recently lieutenant colonel, Motor Transport Corps, resumes his old position as assistant manager Philadelphia branch.

PREMIUMS FOR JORDAN WORKERS

Cleveland, Ohio, July 4—The Jordan Motor Car Co. presented \$25,000 in premiums to its workers at the annual Jordan picnic here recently. All who had been in the service of the company for two years or more received a 15 per cent premium on their previous year's wages and are called blue ribbon employees. Those who have served the company a year or more are green ribbon employees and got 12 per cent. Those with a term of service less than a year received 10 per cent and are in the white ribbon class.

Tour to Show Truck Value on Farm

3000-Mile Demonstration Will Be First National Event of Its Kind

CHICAGO, July 5—The national truck development tour, reported in earlier issues as planned by the National Association of Motor Truck Sales Managers is developing into a much more important proposition than early reports indicated. The tour has as its main purpose the development of truck use on the farm, but its scope is broader than that inasmuch as the tour will preach the motorization of the farm, with the truck as the keynote of this motorization. Not only will the value of the truck as a means of transportation for the farmer be taught by special speakers and by example of the trucks themselves, but also its application to other farm uses, particularly those where belt power is needed, will be campaigned.

All, or nearly all, the twenty to twenty-five motor trucks will be equipped with power take-off and will demonstrate the use of the truck in driving such small power machines as cream separators, ensilage cutters and power saws. Some of this equipment will be carried on the trucks, which also will give demonstrations with equipment already on the farm.

Not only will efforts be directed toward the education of the farmer in the value of the truck but truck dealers and prospective dealers also will get first-hand demonstrations and instructions in the methods of using the truck on the farm and special sales arguments for them. The financing of the dealer and farmer in truck purchases by the local banker will be made one of the features of the tour. A special representative of the Illinois State Bankers' Association

will accompany the trucks and will make it his point to convince the local banker of the necessity of assisting the financing of truck purchases by dealer and farmer and show him how to do it properly.

The Pan American Union is taking a direct interest in the demonstration and will have a special representative in order that the lessons may be transmitted to other countries in the union and will take moving pictures for use in Latin-American countries. Special speakers who will take up various phases of the truck in transportation and on the farm will be on hand at every noon and night stop, and the tour will be accompanied by a band from the Naval Training Station.

Final Plans Made

Final plans for the run were completed this week at a meeting of the executive committee of the National Association of Motor Truck Sales Managers. One change in the previous plan was made by postponing the time of start one week. The demonstration tour will start from Grant Park, Chicago, Aug. 4, and will take 60 days, reaching six states and such cities as Dubuque, Cedar Rapids, Des Moines, Bismarck, Grand Forks, Fargo, Minneapolis, Madison and Milwaukee. It is anticipated that from twenty to twenty-five trucks will participate, one truck from each factory. At this time eighteen factories have entered trucks. These all will be pneumatic-tired.

Truck demonstration tours have been carried on successfully in several portions of the country, but this is the first national demonstration tour. It is fathered by the National Association of Motor Truck Sales Managers, a comparatively young organization. Formed less than a year ago with only thirteen members, it now has sixty manufacturers in its membership. Its president, J. E. Tracy, general sales manager of the Sterling Motor Truck Co., is most active in the promotion of the national demonstration. The actual detail work is being directed by Director-General W. F. Sturm, who has opened offices for the purpose in Chicago.

TIRES DELIVERED BY PLANE

Toledo, Ohio, July 5—Fast aerial express, as it is termed, delivered a load of tires to Willys-Overland here from the Federal Tire Co., Cudahy, Wis. The trip was arranged by George W. Browne, Milwaukee distributor for Willys-Overland, who expects to handle Curtiss planes for commercial use and to maintain several of these express runs. The voyage of 300 miles was practically without incident. A stop was made at Chicago for gasoline.



Delivering tires to the plane at Cudahy for fast aerial express delivery to Willys-Overland in Toledo

Gaston Chevrolet Sets 100-Mile Record

Smashes World's Mark Set by Brother for Distance When He Takes Event at Sheephead Bay Speedway with Speed of 110.5 M.P.H.



Gaston Chevrolet, who not only won the 100-mile but set a new record

SHEEPSHEAD BAY, N. Y., July 4—Gaston Chevrolet hung up a new world's record—54 min. 17½ sec. for 100 miles—in the Independence Day sweepstakes here to-day.

Driving a four-cylinder Frontenac, the winning pilot rounded the fifty laps without a single stop and at an average speed of 110.5 m. p. h. His time, attested by the A. A. A. Contest Board and declared to be without equal in foreign racing, clipped 3 sec. off the record made by his brother, Louis Chevrolet, in a car of similar type in the Harkness Trophy race here in 1917.

The Frontenac, functioning perfectly, whipped off some of the 2-mile circuits in less than 64 sec., averaging 65.14 sec. a lap over the entire course.

Howard Wilcox finished second in 58 min. 37 3/5 sec., crossing the tape four laps behind Chevrolet. Dave Lewis in a Meteor, with an eight-cylinder Deussenberg engine, took third money.

New 10-Mile Record

A second card of the day's program, a match race between Wilcox and Ralph de Palma for three heats of 10 miles each, was called off at the end of the first heat as a result of piston trouble on the big Packard which also put de Palma out of the 100-mile event. The five-lap spin, however, gave Wilcox an opportunity to establish a new American record—5 min. 22 1/5 sec.—for the 10 miles.

The big race drew a crowd of 33,000 persons, who, while deprived of the thrills that go with accidents and closely contested events, showed keen interest. Cheering was only occasional and not at all frenzied, because excitement was lacking owing to Chevrolet's

easy victory, but the maneuvers of the cars were closely watched and fully three-fourths of the spectators remained in their seats upward of an hour after the racing was over, watching several of the drivers practice sprints.

Day Without Accidents

Though tuning-up work the day previous had put the second Peugeot car out of the race, killing the mechanic and seriously injuring the pilot, Ray Howard, when the machine overturned on one of the embankments, the 100-mile event was without accident. The track, despite a heavy expenditure in replanking, was far from being in perfect condition, but the steering apparatus on all the cars held fast and the field was small enough to eliminate the possibility of spills through crowding.

Chevrolet's car was the only entrant to avoid a stop at the pits. The machine escaped tire trouble and the engine worked so smoothly the driver declared he could have cut his time materially had he not eased up, owing to lack of dangerous competition, after the thirty-second lap. Of eleven starters, eight finished, but with the exception of the winner all made from one to three halts for minor adjustments, predominantly to



The match race was short but Wilcox had time to set a new record

replace tires punctured or blown out on the battered plank track. The Frontenac, however, made circuit after circuit without a sign of trouble, maintaining the lead throughout except during a three-lap battle with Joe Boyer in another Frontenac in the 30-mile stage of the race.

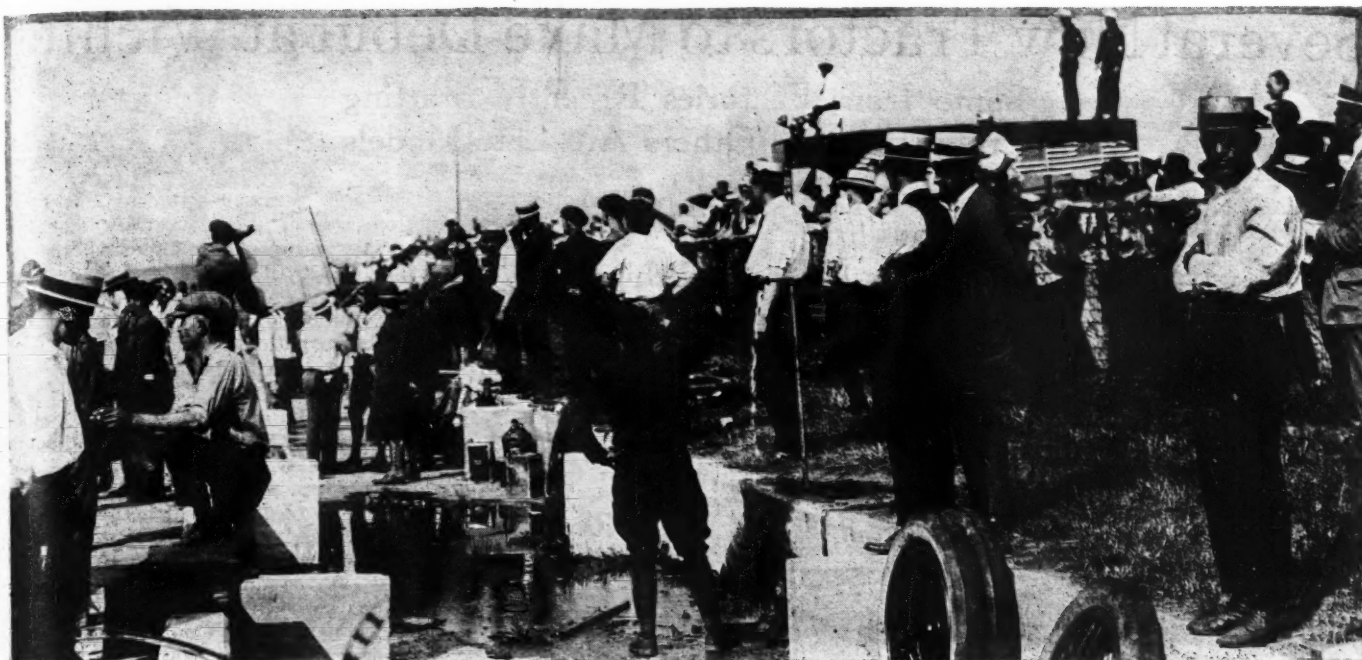
In fact, the real race, until engine trouble forced Boyer out in the thirty-third lap, was between the two Frontenacs. They ran abreast, Chevrolet less than half a length in the lead for 28 miles, when Boyer forged ahead for the fifteenth, sixteenth and seventeenth laps. Chevrolet crept past him in the eighteenth and gradually lengthened the gap between the two machines up to the thirty-third, when Boyer's engine began to thump on the second turn and he was

The Finish

DRIVER	CAR	PRIZE
Chevrolet	Frontenac	\$4,000
Wilcox	Peugeot	2,000
Lewis	Meteor	1,200
O'Donnell	Deussenberg	1,000
Vall	Hudson	600
Hickey	Stickel	500
Thomas	Mercer	400
Vetere	Deussenberg	300



There were no accidents, so the ambulances served as impromptu boxes



The few stops at the pits made the pitmen look just like the other spectators most of the time

forced to the pits, later quitting the race and going to the garage.

Wilcox made three stops, the first in the ninth lap, when he was running third, close in the wake of the Frontenacs. The halt, to change a tire, cost him half a lap, but the Peugeot pilot plunged gamely into the grind and was nearly up with the leaders when another tire went flat. Taking the track again, he ranged alongside Chevrolet in the fourteenth lap and until the thirty-eighth paced the Frontenac by a half a length in one of the prettiest speed spurts of the day. Then another tire went down, but the pitmen made a lightning change and Wilcox was back in the race for a brilliant drive that brought him across the tape in second place.

Lewis Stopped Three Times

Lewis, who made the first few laps in fourth and third places, finished third despite three halts, two to change tires and one to replace five spark plugs which were flooded wit hoil during one of the stops for tire trouble. The Meteor rolled up to the pits in the fifteenth lap, with a front tire down. The mishap was repeated at the end of the thirty-fifth mile and Lewis had gone only a few laps after this halt when the spark plugs went bad. The adjustment seemed to have put him definitely in the second division, but Dave put on all speed and swept into third place ahead of Eddie O'Donnell and Ira Vail, whose Deussenberg and Hudson fought right up to the tape for fourth money, which went to O'Donnell.

The race gave a good demonstration of staying ability. Only one quit at the outset—Aldo Franchi's Aetna, equipped with a Deussenberg four-cylinder engine, which rounded two laps with only three of its four cylinders hitting before it headed for the garage. Tommy Milton, who won the 10-mile on this track June 14, went to the pits with engine trouble

in the fourth lap and again in the fifteenth, when his Deussenberg was wheeled to the garage. Boyer's Frontenac worked without a hitch until the thirty-third lap, when necessary engine adjustments required so much time that the driver, until then Chevrolet's chief rival, dropped out of the contest. The seven cars which followed the winner over the finish line suffered mostly from tire

Mulford Wins at Tacoma

TACOMA, Wash., July 4—Special telegram—Ralph Mulford won the 40-mile race here to-day. His time was 24:02.4, or at the rate of 99.8 m. p. h. The event was a contest by Mulford and Durant for first place. Louis Chevrolet was third with Eddie Hearne and Resta following.

Louis Chevrolet won the second race, which was for 60 miles. He led the field all the way. Mulford, Hearne, Durant and Resta finished in the order named. Chevrolet's time was 36:47.5, or at the rate of 98½ m. p. h.

trouble, the halts for mechanical adjustments being only momentary. As a result the pitmen had an easy time of it, their quarters showing real activity only before and after the race.

Chevrolet declared after the race that he could have brought his time near the 50-min. mark had he been pressed for the lead. He held back the fuel flow, he said, after Boyer was forced off the track, knowing that Wilcox and Lewis were several laps behind after their stops. His car was very little changed in design, he stated, from the speedster in which his brother made the former 100-mile record.

Clean Sportsmanship Cheered

The day's sport started with the Wilcox-de Palma race, which ended with

de Palma's discovery after the first heat of a cracked piston, which he was not able to repair during the progress of the big race so as to finish the match. In the single heat, however, the cars ran wheel to wheel throughout most of the five laps, coming across the tape so close the officials were not unanimous in announcing a victory for de Palma by a foot. Then the crowd witnessed an exhibition of the sort of sportsmanship which has been an important contributing factor to the popularity of racing, when de Palma, declaring that Wilcox had preceded him over the line by at least 3 or 4 in., insisted on a reversal of the decision, in which the judges acquiesced, while the grandstand applauded. This gave Wilcox the new 10-mile record, which he failed after the big race to equal in a five-lap exhibition spin.

\$8,000 PRIZES FOR ELGIN

Chicago, July 5—Arrangements for resumption of the Elgin road races Aug. 23 have reached the point where the race can be said to be assured. The entry blanks will be out next week, and even now eight entries have been definitely promised. The race will be for 308 miles on the 8.6-mile course and will be limited to 300-cu. in. cars. Prizes will total \$8,000, split five ways with probably first prize at \$4,000. The course is reported to be in very good condition now and will require but little work to put it in tiptop shape for the event. Original plans contemplated two days' events, but it has been decided to have but one day and one race. The interest exhibited on the part of speed devotees assures an entry list as large as past Elgin races.

In addition to the cash prize the winner will get the National Elgin trophy, which is valued at as much.

Several New Tractors to Make Debut at Wichita

Some from Factories Recently Starting Production and Others Are Late Models

CHICAGO, July 5—Among the many tractors which will be called upon to show their paces at the National Tractor Demonstration at Wichita next week are several which never before have figured at an event of the kind. Some of these represent the product of factories which just have come into production. Others are now models which have been developed during the last year by well known concerns who have made changes more or less important in the designs of their machines to keep them up with the march of events.

One of the brand new machines is the Nelson four-wheel-drive, manufactured by the Nelson Corp., Chicago and Boston. Special features on the Nelson are the four-wheel drive, and the inclosed chain final drive. A conspicuous feature is the open-face wheel which, it is claimed, solves the soil-packing problem. The Nelson is made in three sizes, 15-24, 20-28 and 35-50. These are designated as three, four and eight-plow machines respectively.

Uncle Sam Tractor

Another three-plow tractor which will make its initial bow at Wichita is the Uncle Sam, manufactured by the U. S. Tractor & Machinery Co., Menasha, Wis. This machine was brought out last year, as a matter of fact, but production was stopped by the restrictions by the Government. Since then a new company has been organized at Menasha, the first unit of a factory has been built and the company now is going into production. Two tractors will be shown at Wichita, one with standard equipment and the other with lights and starter.

The La Crosse Tractor Co., La Crosse, Wis., will demonstrate the new Baby model M, 6-12 kerosene-burning, all-purpose, one-man farm tractor. The company has been developing this machine

for the last year or two, and it will be shown for the first time at Wichita.

Wichita Exhibitors

Advance-Rumley Thresher Co.
Allis-Chalmers Mfg. Co.
Aultman Taylor Mach. Co.
Avery Co.
Beeman Garden Tractor Co.
Bates Machine & Tractor Co.
Bean Spray Pump Co.
Best, C. L., Gas Traction Co.
Brillion Iron Works
Bullock Tractor Co.
Case Plow Works
J. I. Case T. M. Co.
Cleveland Tractor Co.
Dart Truck & Tractor Corp.
Dauch Mfg. Co.
Dayton-Dowd Co.
Deere & Co.
Downes, P. J., Co.
Eagle Mfg. Co.
Electric Wheel Co.
Emerson-Brantingham Co.
Frick Co.
Ford, Henry, & Son.
Four Drive Tractor Co.
Gray Tractor Co.
General Ordnance Co.
Hession Tiller & Tractor Corp.
Hart-Parr Co.
Holt Mfg. Co.
Huber Mfg. Co.
Illinois Tractor Co.
International Harvester Co.
Kinnard & Sons Mfg. Co.
LaCrosse Plow Co.
LaCrosse Tractor Co.
Lauson, John, Mfg. Co.
Minneapolis Steel & Mach. Co.
Moline Plow Co.
Monarch Tractor Co.
Nelson Corp.
Ohio Mfg. Co.
Oliver Chilled Plow Works
Parrett Tractor Co.
Peoria Tractor Corp.
Pioneer Tractor Mfg. Co.
Port Huron Engine & Thresher Co.
Rock Island Plow Co.
Roderick Lean Mfg. Co.
Royer Tractor Co.
Russell & Co., The
Scientific Farming Machinery Co.
Square Turn Tractor Co.
Turner Mfg. Co.
U. S. Tractor & Machinery Co.
Velie Carriage Co.
Vulcan Plow Co.
Waterloo Gasoline Engine Co.
Western Tractor Co.
Wetmore, H. A.
Wichita Tractor Co.
Wisconsin Farm Tractor Co.
Wolverine Tractor Co.

The new Mark 6 Princess Pat two-bottom tractor tiller, a larger machine than that shown at the Minneapolis show last winter, will be one of the novelties of the demonstration.

The Bullock Tractor Co., Chicago, is not new to national demonstrations, but next week it will demonstrate its new model 18-30 model G. This machine has been specially designed to meet conditions in the oil fields and departs in some essential particulars from the Bullock farm tractors, which also will be shown.

Of the two models which the Hession Tiller & Tractor Corp., Buffalo, N. Y., will show, one, the 14-28, is entirely new. This is a three-plow tractor with greater plowing speed than tractors of this capacity usually develop. Interest will be increased in this exhibit because of the transcontinental run one of the Wheat tractors now is making.

Changes in Wisconsin

The Wisconsin Farm Tractor Co., Sauk City, Wis., while not having made such fundamental changes in design as to produce a distinctively new model, nevertheless has inclosed the gears on the Wisconsin tractor and made such other changes as to entitle it to be called new. The machine which will be shown this year will incorporate all the changes which have been made.

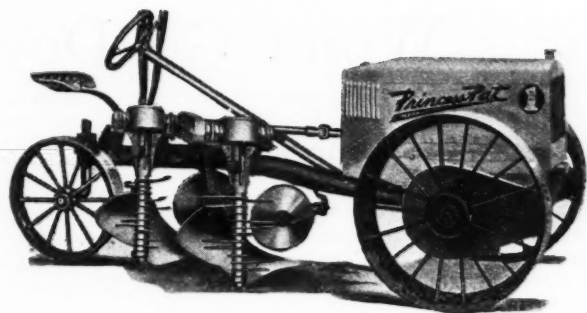
One new model, a lightweight, small tractor of 12-20 capacity, will be included in the exhibit of the Advance-Rumely Thresher Co., La Porte, Ind. Except for a reduction in weight and a refinement in design, the new model does not depart far from the standard construction of the OilPull line.

The G-O tractor, which will be demonstrated by the General Ordnance Co., Cedar Rapids, Iowa, may be regarded as new. The G-O is a development of the

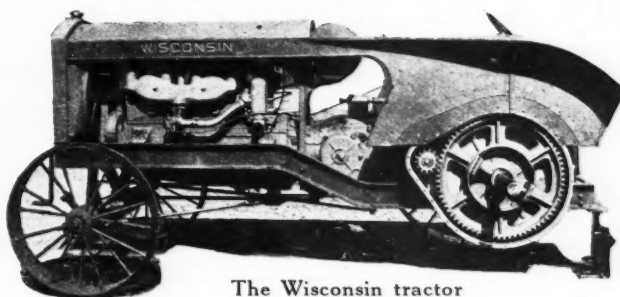
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Getting ready for the national tractor demonstration—clearing the land for plowing by machines at Wichita

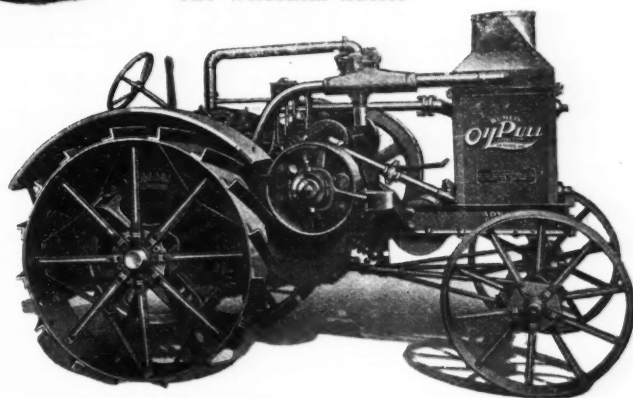


The new Princess Pat

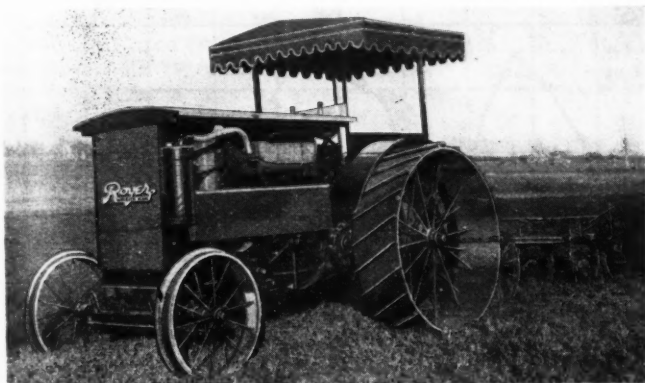


The Wisconsin tractor

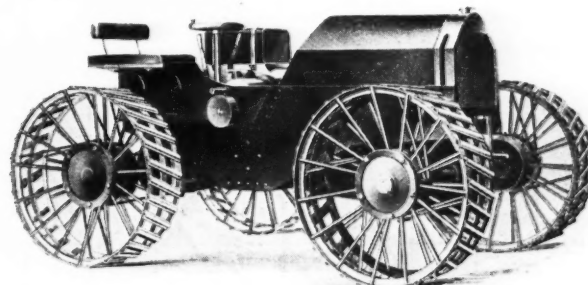
These Will Make Their
Debut at National Dem-
onstration



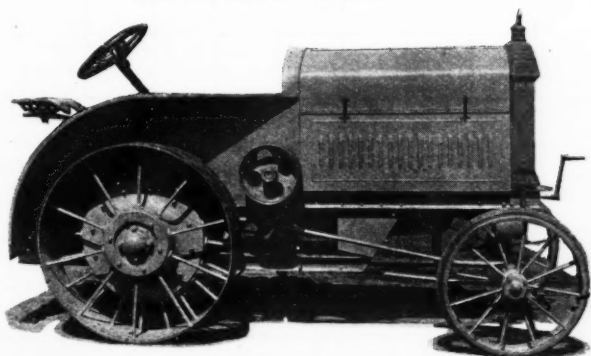
The latest OilPull tractor



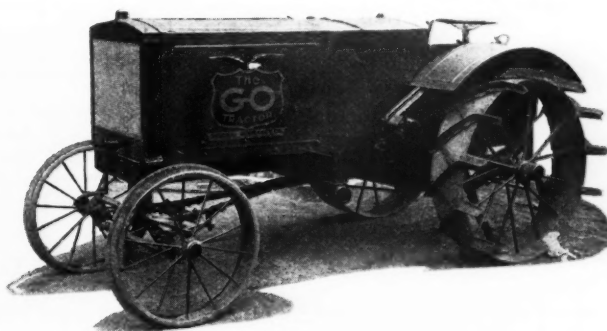
The new Royer machine



One of the three Nelson models



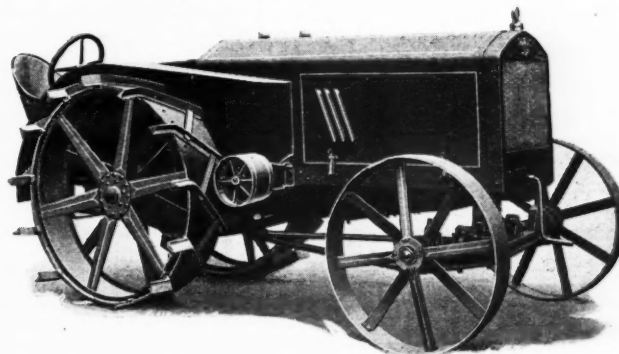
Dart will be at Wichita



The G-O tractor



Pioneer 18-36 model



The Uncle Sam tractor

Why Car and Truck Prices Won't Go Down

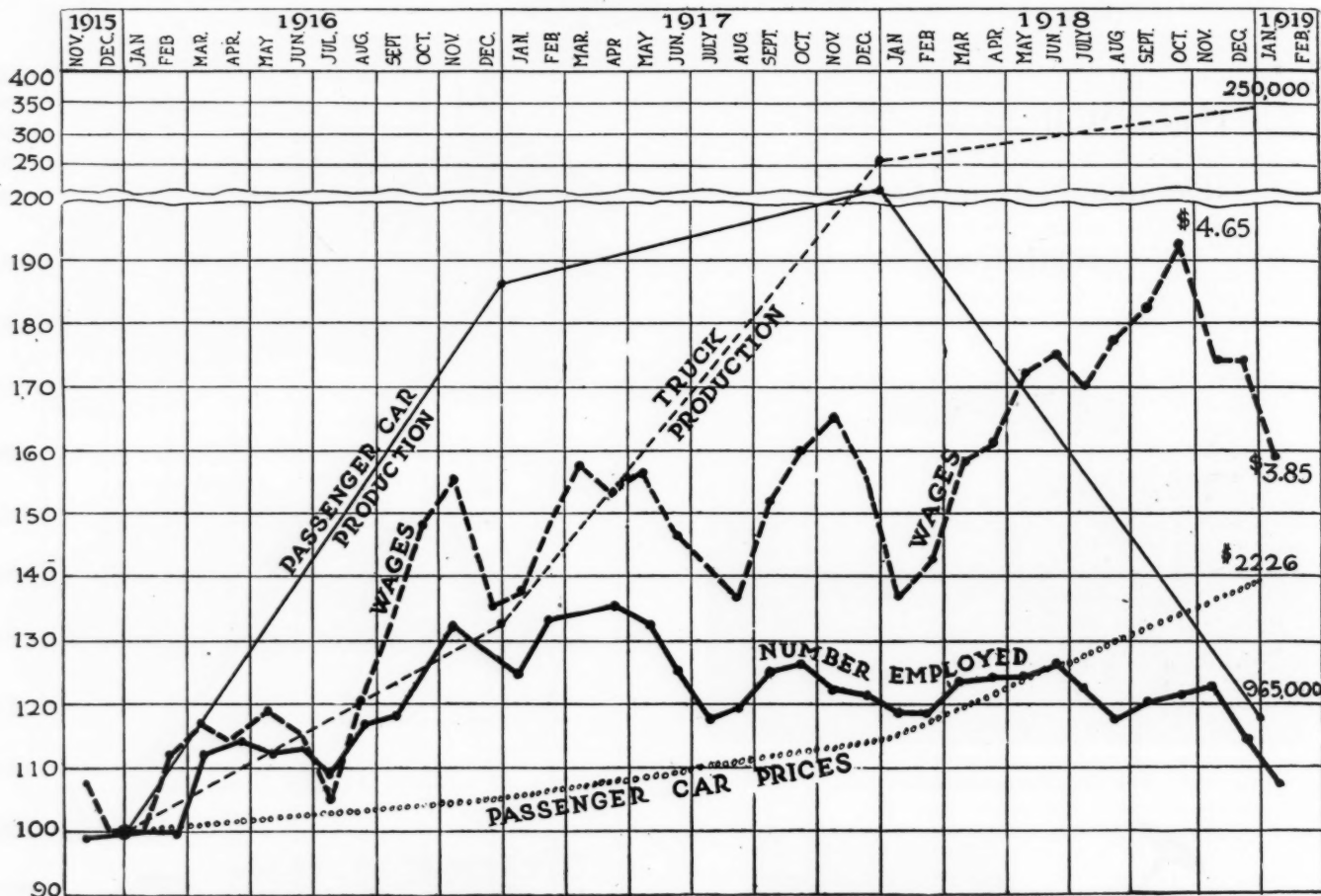
Ranges of Wages in Automotive Industry Help Explain Failure to Drop

THESE charts are of much interest in that they help explain, if they do not explain fully, the reason why the prices of cars and trucks seem so re-

luctant to come down. Taken in connection with recent news events, such as scarcity of parts and, to a certain extent, labor and the general situation in labor

throughout the country, it becomes easier to understand the price situation.

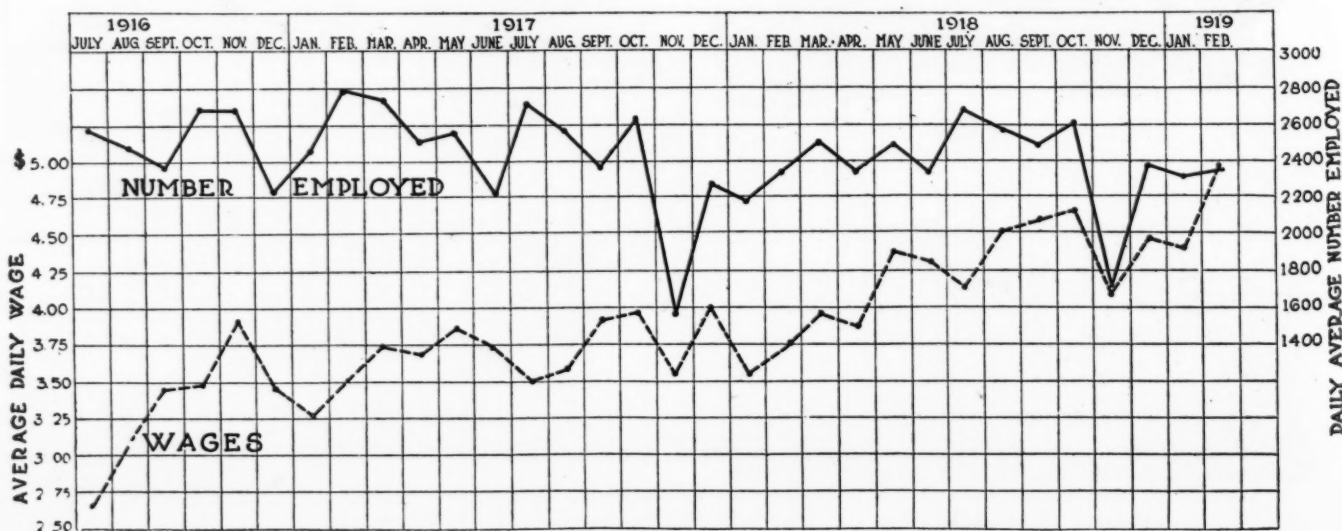
The charts show the variation in wages for four years. The increase is



PASSENGER CAR PRODUCTION--100 = 818,000
 PASSENGER CAR PRICES-----100 = \$1,600
 TRUCK PRODUCTION-----100 = 74,000
 WAGES-----100 = \$2.42

Chart 2, above—Number employed, daily wage in industry and production and average selling price of cars and trucks

Fig. 3, below—Average daily number employed and wages in the industry



accounted for by different factors. First, the effort to meet the demand for quick production of war materials for the allies affected wages. Then the withdrawal of men for military service after this country entered the war enters in. The high cost of living has been contributory, though usually the demand for men in the automotive industry has kept the wage increase ahead of the cost of living increase.

As the second chart shows, increased prices for cars apparently have had no serious effect on sales. Production increased constantly up to 1918, when the Government limited the output.

The increased prices of cars, and trucks, apparently is due to the increased prices of steel and iron and the growing wage scale. Prices of iron and steel rose to unprecedented heights in 1917, increasing more than 300 per cent. A reduction to an increase of 150 per cent above pre-war prices was effected in 1918, when the Government exercised its price control. Crude rubber, although fluctuating during the last four years, has maintained a fairly stable price level.

The chart showing the wages and number employed in the industry points out that wage increases have been as high as 33.4 per cent for one year, while decreases never have totaled more than 6 per cent. Working organizations have increased as much as 9.7 per cent, when in November, 1919, they increased to 87,536 from 79,831 employed in November of the preceding year. The greatest wage

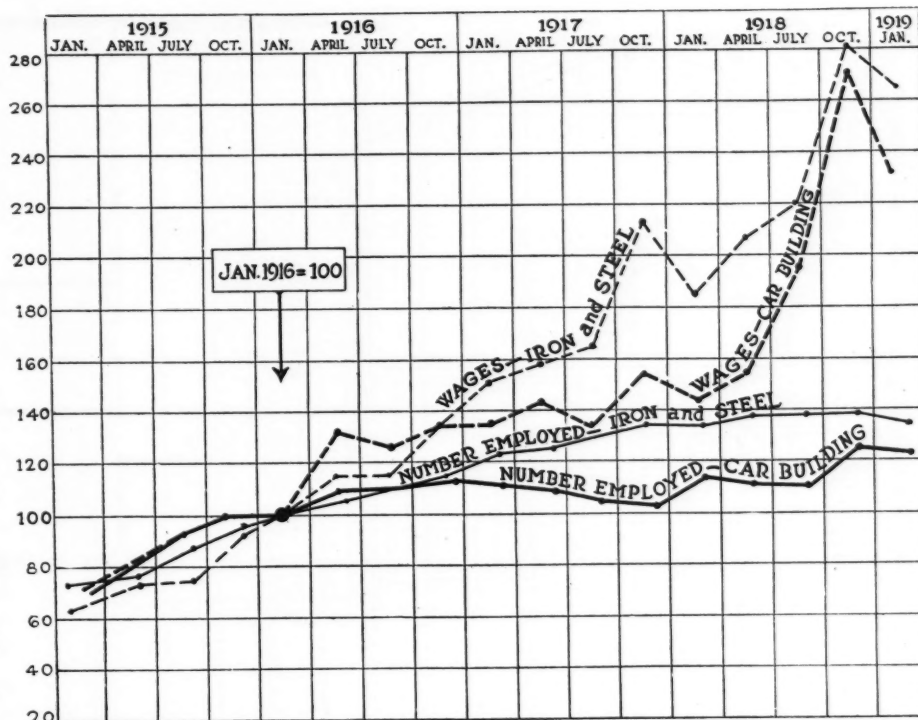


Chart 1—Relative number employed and wages paid in other large industries, based on figures for January, 1916, as 100 per cent

increase was recorded in July, 1917, when the payroll of thirty-six manufacturers totaled \$2,154,737 as compared with \$1,615,257 in the same factories for July, 1916.

to machine these castings than heretofore.

There are many other items entering into the increased cost of production. One of the important ones is the labor situation. Labor in Detroit is not only costing more than ever before, but it is less efficient. The turn-over in some of the plants is excessive.

One company, the Gemmer Mfg. Co., maker of steering gears, reports a monthly turnover averaging 30 per cent. This turnover has occurred in the face of working conditions which are excellent. Everything to make it more convenient and more pleasant for the workmen may be found in the Gemmer plant. The company has its factory social organizations and also a financial organization which lends money to working men, to build homes. Despite these conditions the turnover is excessive. There is such a big demand for labor in Detroit at present it has made labor indifferent. A year ago 100 men would do 15 per cent more work than 100 to-day.

No Reduction in Sight

Among the manufacturers as well as the dealers there is a feeling that all prices ultimately must go up. There is no prospect of a reduction in the face of the present material and labor situations.

About the only thing that will offset high production costs is increased production. This is almost impossible due to the fact that labor is restless and the material supply is unsteady. The parts makers are not in normal production and may not be for some time. This has affected the production in the plants. During June production was approximately 60 per cent normal, according to figures obtained from thirty-two leading car manufacturers in Michigan and Ohio.

Prices of Motor Vehicles Going Up

Recent Increases and Future Outlook

DETROIT, July 7—The prices of motor vehicles are going up. Due to a 25 to 30 per cent increase in cost of materials, practically every big motor car company in the Detroit district is raising, or is about to raise, the price of its product. Several price increase announcements were made this week, and the next thirty days will see the majority of companies issuing new and higher price schedules.

The Studebaker Corp. increased the price of five models, \$100 and \$150, effective July 3. Light Studebaker fours and sixes are increased \$100, while the heavy six coupe and sedan are up \$150.

The price of the Oldsmobile eight has been increased \$100, from \$1,795 to \$1,895. While the price of other models remains unchanged, every indication points to extension of the increase to other models.

The prices of Chalmers cars have gone up \$120 on the five-passenger and \$150 on the seven passenger. New prices are \$1,685 and \$1,865 respectively.

Maxwell is increasing \$90 on all cars and \$100 on the truck. The five passenger car is \$985 and the truck with stake body is \$1,280. Both Chalmers and Maxwell increases are effective July 12.

Hudson has raised the price of all Hudson cars \$100 and the Essex, \$200,

except the Essex sedan, which remains unchanged.

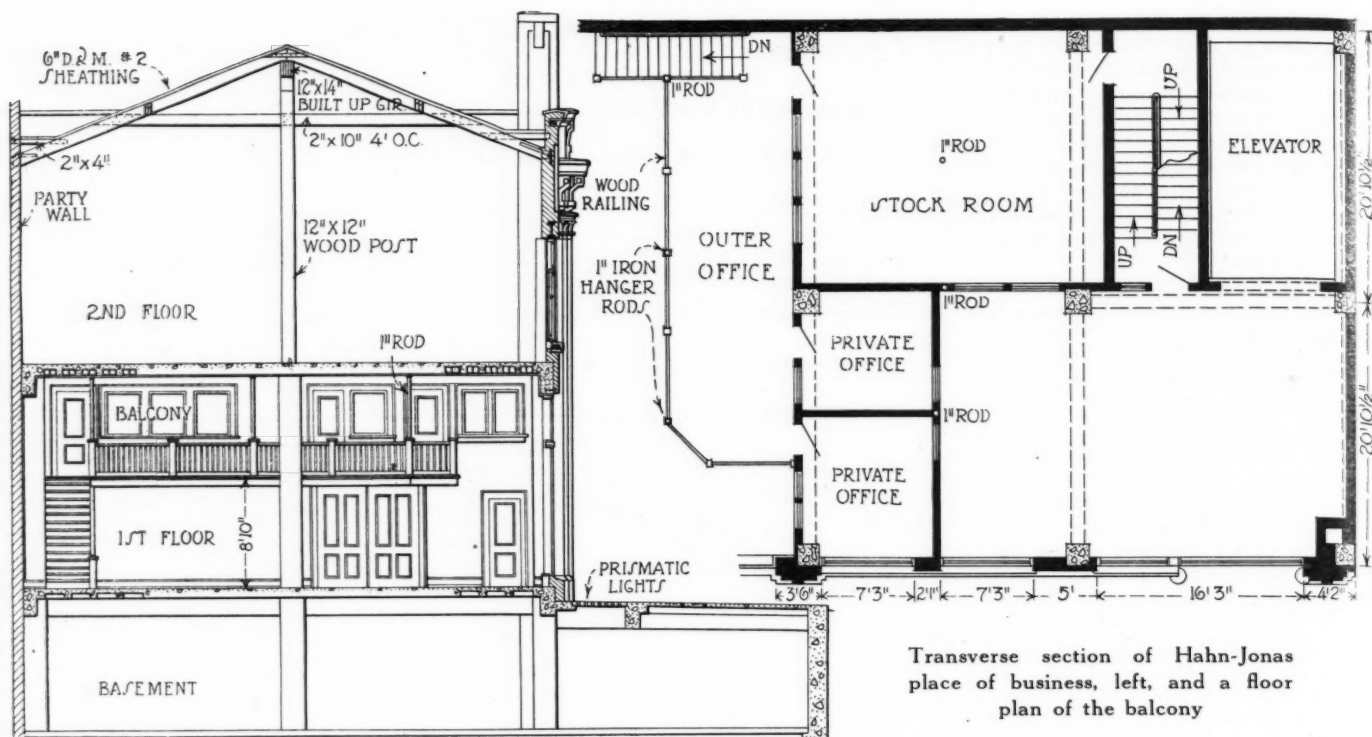
Chevrolet, it is rumored, will inaugurate a new and higher price schedule on all models in August.

Paige-Detroit will bring out its new series very shortly, and it is altogether probable that the price will go up accordingly. If Paige is going to increase its price, the announcement will be made within thirty days.

Cadillac has raised the price of all inclosed models from \$200 to \$300, but the price of the open cars remains unchanged.

Hupp prices have been guaranteed until Aug. 1. The future price policy of this company is uncertain but will be announced shortly.

The general price increase is going to affect the truck industry as well as the car business. It is due entirely to the cost of material and labor. The price of axles, pressed steel frames, steering gears, stampings and the majority of other parts is up from 15 to 40 per cent. The price of castings remains about the same due to decrease in the cost of steel, resulting from the action of the Government in fixing steel prices. While the casting prices are stationary, it is costing the companies 25 per cent more money



Built for Automotive Service

Sales and Repairs on Cars, Trucks and Tractors

SIoux FALLS, S. D., owes a lot to the motor car men. Many of the best buildings in the city have been planned and erected to house the motor car industry. While all the automotive business of the city, which is varied and extensive, is not centralized in a district, as is the case in some cities, enough has been concentrated in one section to constitute a distinct motor car district. In this locality there are several buildings which were designed especially for the motor car trade and which are modern and model. Among these is the building occupied by the Hahn-Jonas Motor Co.

The Hahn-Jonas Motor Co. distributes Cadillac, Lexington and Harroun cars, Hawkeye trucks and Hart-Parr tractors, making it distinctively an automotive concern. In magnitude of business and perfection of equipment it ranks as one of the most important of the automotive concerns in the city.

Corner Location

The building occupied by the company is located on a corner, with showroom and salesroom to the front and garage to the rear. The building is fireproof, two stories and basement. The distinctive feature of the structure, exteriorly, is the wide expanse of show window space, an advantage which is used to the full. Each show window is wide enough to display a car and is so utilized. Border lights are used, always kept lighted at night, making the company window display one of the most brilliant and attractive places in the business section.

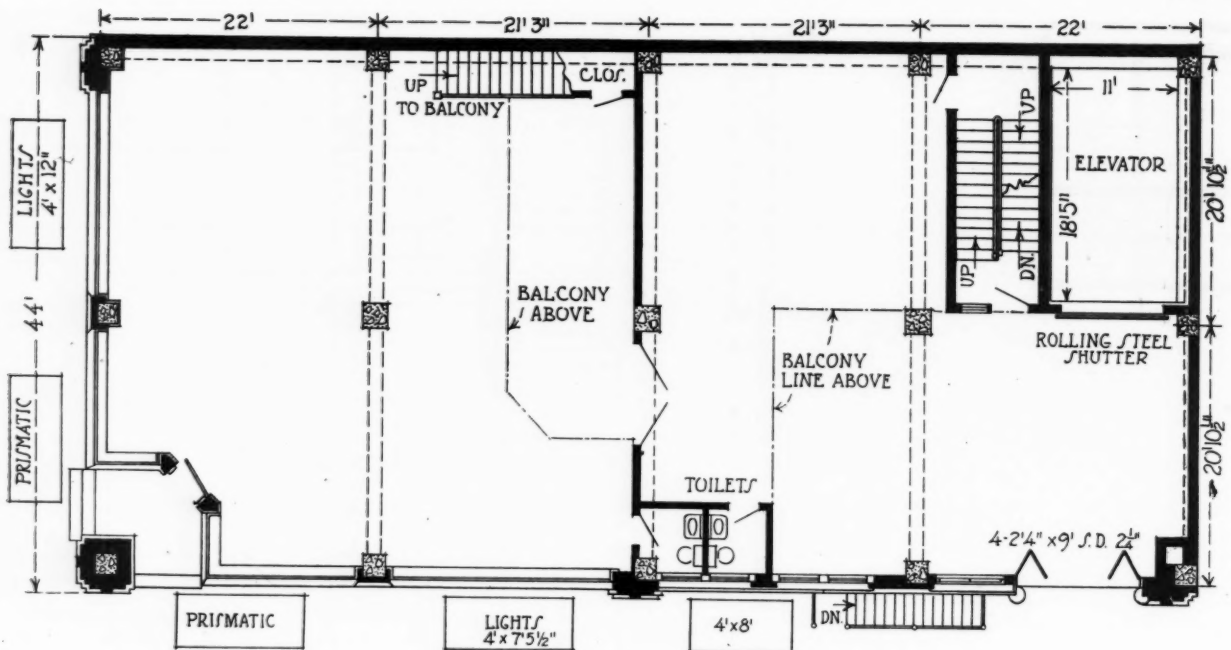
The showroom is unusually large for the building. The large windows afford an abundance of light, which is tempered by the soft tones of the decorative scheme, which is just gray enough to escape being white. The showroom floor is unbroken by office partitions or other obstructions. The offices, general and private, occupy a balcony, where also is

the parts stockroom. This makes for economy of space as well as for convenience. The balcony is reached by a stairway from the showroom floor but communicates directly at the rear with the other parts of the building.

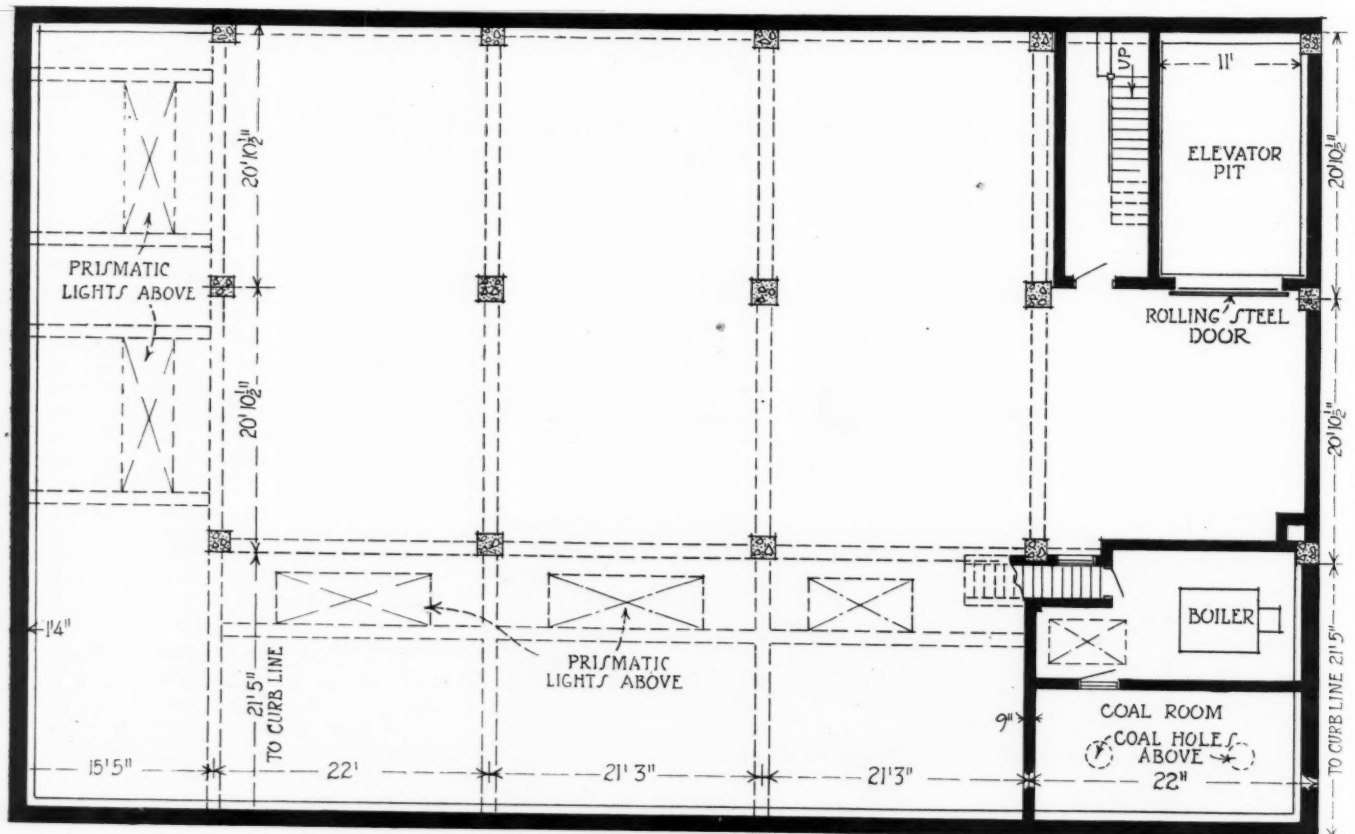
The top floor is used for new car storage, used cars and service. The building has a high-ceilinged, cemented basement,



Sales and service station of the Hahn-Jonas Motor Co., Sioux Falls, S. D. Note large display windows, which always are lighted at night



First floor plan, showing location of balcony for parts stockroom and office



Layout of basement of the Hahn-Jonas Motor Co., Sioux Falls, S. D.

PLANES ON DEROIT ROW

Detroit, July 4—A big canvas sign saying, "Airplanes for Immediate Delivery," went up over the Thompson Auto Co. salesrooms and herald the advent of the airplane on Detroit's row. The Thompson company, Maxwell-Chalmers distributor, has purchased twenty Curtiss machines from the United Aircraft Corp. and is selling them faster than they can be delivered. Last Wednesday

the salesroom was cleared of cars and a plane assembled therein. Before the day was over four machines were sold at \$3,000 each.

Teaches Purchasers

Captain L. J. Robinson, formerly of the Air Service, is sales manager of the airplane department. He is teaching his airplane purchasers how to fly in 10 hr. at morrow field, on the outskirts of Detroit.

JACKSON TRUCK IN FORTNIGHT

Jackson, Mich., July 4—The Jackson Automobile Co. will start production on its 3½-ton four-wheel-drive truck within two weeks. This company, which has been practically idle since the signing of the armistice, has discontinued manufacture of cars and hereafter will devote itself to truck production only. Material for the initial run of trucks has been obtained.

Acceptance of Paper

Federal Reserve Bank States
Dealers' Notes Handled as
Others Are

Text of Opinion Given to N. A.
D. A.

ST. LOUIS, MO., July 5—That the acceptance of the commercial paper of a motor car dealer by Federal reserve banks is based on the same principles as govern the acceptance of paper of every other business, that is, the dealer individually must be a good risk and the collateral approved, the Federal Reserve bank of St. Louis has advised the National Automobile Dealers' Association, quoting a reserve bank ruling uniform throughout the country and issued March 1, 1918.

This opinion, sought by the N. A. D. A. to clear up a misunderstanding as to the policy followed by reserve banks toward the motor car dealer, makes it clear that the paper of the motor car dealer is just as good as that of a dry goods merchant or a machinery man or other dealer.

The reserve bank does not directly concern itself with motor car dealer's paper. When a dealer sells a car on time he usually takes a note for the remainder of the purchase price. This note, which is secured by a mortgage on the car, is taken to the bank and sold by the dealer after he indorses it.

"When the bank wishes to replace the money taken out of its vaults for the dealer," Harry G. Moock, business manager of the N. A. D. A., explains, "it goes to the Federal reserve bank with its own paper, with the note turned in by the dealer as collateral for deposit. This means then that the Federal reserve bank has as its security first the paper of the member bank, then the security of the member bank as guarantor of the customer's note, then the indorsement of the dealer on the customer's note and lastly a lien upon the car, affording it virtually a four-ply security."

Mr. Moock explains that the reason for some of the inference against the motor car dealer's paper with the Federal reserve banks is believed to have been the result of a ruling refusing to take the paper of a New York motor car finance corporation, which in no way affected the finance corporation's ability to obtain loans on their security, although keeping this security from being rediscounted at the reserve banks.

TRACTORS AT WICHITA

(Concluded from page 18)

machine formerly known as the National, but many important changes in design have been made.

The Dart Truck & Tractor Corp., Waterloo, Iowa, will make its first appearance at a national demonstration with the Dart Blue J. This machine was exhibited at the Kansas City tractor



Army scrap rubber stored in Paris. The heap now reaches the windows on the second floor of the adjoining apartment houses

show last winter, and no important changes in design have been made since that time.

The Frick Co., Waynesboro, Pa., will include in its display one new model of 15-30 rating. The design of the new model follows closely that of the 12-25, already introduced to the trade and shown at previous demonstrations.

While of the same general design as other models of the same make the 12-7 Monarch, manufactured by the Monarch Tractor Co., Watertown, Wis., is new. The new machine is built lower than were previous models and has been designed especially for the small farm.

The Pioneer Tractor Mfg. Co., Winona, Minn., will include in its exhibit the new 18-36 model. The distinctive feature of this machine is its large wheel area.

The Royer Tractor Co., Wichita, Kan., will introduce its new model D 1919 at the demonstration. The company expects to concentrate future reduction on the new machine, and it will have added interest for this reason.

The O. J. Watson Motor Co., Wichita, is operating a Fordson continuously for thirty days and tabulating results. The machine had been running seventeen and one-half days or 420 hr., up to July 3 with a loss of 5½ min. At that time the engine was stopped to clean the fuel line, which was choked. Prior to this halt, the tractor had run fifteen and one-half days or 372 hr., without a halt. It has cut 310 acres of grain, ploughed 30 acres, disked 20 acres, drilled 10 acres and dragged 44 miles of road. It has passed through several hard rainstorms. The tests are being supervised by representatives of the Kansas State Agricultural School and the Wichita chamber of commerce.

DETROIT PLANS TWO SHOWS

DETROIT, July 4—The Detroit Automobile Dealers' Association will hold its annual show in March. The staging of the show in March last year resulted in

a great amount of business, and the association is now of the opinion that the March date is the more logical time to hold a show than in January. Definite dates for the 1920 show are not decided upon. The Crosstown Garage management has agreed to extend its building out as far as the end of Woodward avenue, thereby adding 25,000 sq. ft. of floor space to the present building. This will give the exhibitors a better chance of display than last year. Although the show was staged last year in the largest available building, the spaces were somewhat cramped and numerous exhibitors were unable to get all of their cars on display.

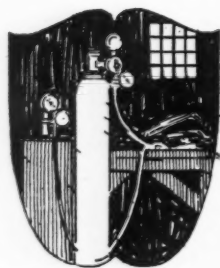
Detroit will hold its first closed car show this October, from the 6th to the 11th, inclusive. The association will not permit the showing of any but a strictly closed car. It will be on the salon order and will be a semi-invitation affair with the ordinary price of admission doubled.

NEW CLYDESDALE MODELS OUT

Clyde, Ohio, July 5—The Clyde Cars Co. has brought out two lighter models of its Clydesdale trucks, No. 32 and 42 respectively. No. 32 is a 1-ton, and No. 42 a 1½-ton.

NEW UNIVERSAL TOOL PLANTS

Detroit, July 5—The Universal Tool Co. has opened factories in Detroit and Windsor, Ontario, during the last two months in addition to its plant in York, Pa. The main offices of the company are to be in Detroit hereafter. New salesmen have been appointed as follows: A. E. Hrobskey will cover New York and the New England states, with headquarters in New York; C. E. Hinkley, Pennsylvania, New Jersey, Maryland and Delaware, with headquarters at the York plant; J. E. Nebrick, Ohio, Michigan and Indiana, with headquarters in Detroit; Merritt Campbell, Illinois, Missouri and Iowa, with headquarters in Indianapolis, Ind.



Autogenous Welding in Automotive Repairs

By Thomas P. Bowman



This is the third installment of a series of articles that are to be published in *MOTOR AGE* each week. The author has had practical experience in motor car repairshops which enables him to present first-hand information on practical welding in a clear and concise manner. No difficulty should be encountered in this work, provided the reader will apply all the methods given herein.—Editor.

Part III—Preheating

IN AUTOGENEOUS welding it is essential that the welding be preceded by some preliminary heating operation, as there are many advantages to be gained by this treatment.

Preheating is employed for two reasons: First, to prevent the effect of expansion and contraction; Second, to decrease the cost of welding by supplying from a cheaper source a considerable volume of the heat required.

When a weld is being done on a large casting, it is entirely too expensive to supply the total amount of required heat from the blowpipe alone. To offset this preheating some cheaper method is used, and the result is usually a saving of from 25 to 60 per cent of the cost of welding. Not only is a great saving of gases effected, but it is possible to accomplish the welding with greater speed, due to the casting being at a higher temperature when the weld is started.

There are various means of carrying out this preliminary heating. The simplest, and one of the most common on light objects, is that of utilizing the secondary, or envelope, flame of the welding blowpipe. In welding thin castings and thin sheet metal work, the secondary flame of the blowpipe needs to be played upon the parts at the line of the weld for only a few seconds in order that the pieces attain a red heat.

If the article to be welded is of fairly large size, the use of a gas- or oil-burning preheating torch is economical. These preheating torches, however, limit the area of the surface covered. They are used consequently more successfully on that work which requires preheating of only a small surface. The flames produced are of sufficient temperature but not the necessary volume to heat evenly the entire casting of any great size. Then, too, the heating zones of these burners vary, because they are operated with an air blast which, unless unusually well controlled, fluctuates in pressure.

CHARCOAL AND COKE FIRE PREHEATING

A common method of preheating is by a charcoal or coke fire built around the article to be welded. The usual procedure is to build a small temporary fire-brick furnace around the piece and then fill in with coke or charcoal loosely set

up. Occasionally coke and charcoal are mixed and ignited after saturation with kerosene. As the combustion of the charcoal or coke is rather low, the preheating is carried out gradually and evenly. An air blast should not be used.

In welding large castings of a complicated nature it is necessary that they be preheated evenly throughout and that the welding be carried on while the casting is at a dull red temperature. It is impossible to do this while the gas or oil burners are playing on the casting, as the blast of the three blowpipes is such that it would interfere seriously with the working of the oxy-acetylene flame. Therefore, the most satisfactory way to accomplish this is to partly bury the casting in charcoal or coke and carry on the work while it is buried in the hot coals. The cost of this method is less than that of any other, and because of its adaptation to application it is used more generally by welders.

Where it is necessary to preheat many castings of a similar nature, such as gas engine cylinders, furnace sections, etc., it is best that a permanent preheating oven or furnace be installed. These furnaces may be designed particularly for the work they are to receive, and the fuel used can be coal, coke, charcoal, gas or oil. In some cases the furnaces are muffled, that is, the flame is not allowed to play directly on the casting. In others the casting is laid directly on the flame. With suitable draft-controlling arrangements it is possible to establish a fairly constant temperature in these furnaces, the advantages of which readily can be seen.

REGULATION OF EXPANSION AND CONTRACTION

As referred to previously, the effect of expansion and contraction is such that it should be given very careful consideration by the welder. Since it is bound to exist to a greater or less extent in the execution of all autogeneous welds, it is essential that it be taken care of by one of several methods.

It is generally possible to offset by careful preheating any serious effects of expansion and contraction. As a representative example see Fig. 9.

First, consider the simplest condition of welding. Assume that a long bar which is free at each end has broken at a point A. In this case the welding may be carried out without any fear of encountering difficulties due to expansion and con-

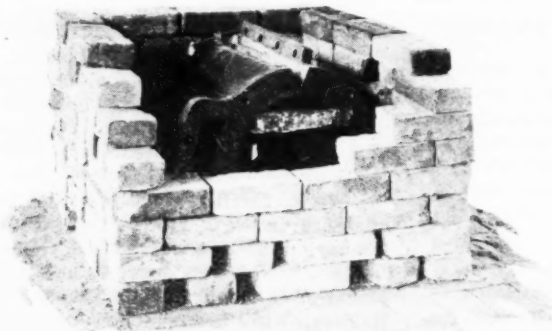


Fig. 7—Preheating furnace partially constructed

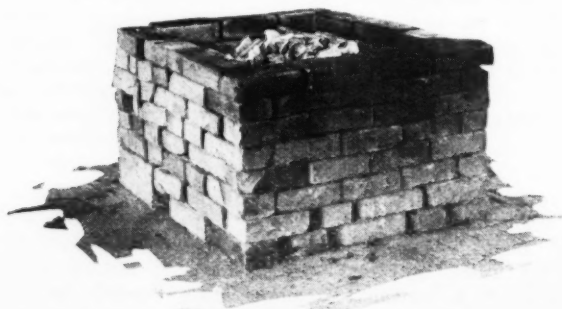


Fig. 8—Preheating air compressor cylinder

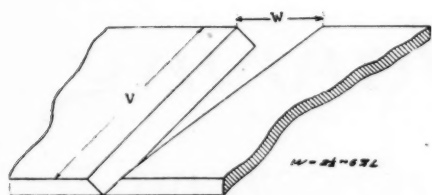


Fig. 10—Overlapping of two plates during welding

traction. The bar is free to expand and contract at each end. While there may be some warping or deformation due to the heat of the welding if the blowpipe is not handled properly, yet there is scarcely any danger of weakening the weld because of internal strains and stresses.

However, let us assume that this bar is part of a casting, as shown at C, which is surrounded and joined to a rigid frame, B and D. In this case the expansion and contraction due to welding must be taken care of. It is readily seen that the expansion is not the force that will cause trouble; for when the two pieces expand during the welding, the metal—which is in a fused condition—is so soft that the expansion will take place in the weld and the edges will approach each other. This will not affect the confining frame.

Consider the action of the metal when it begins to cool. Contraction sets in, and there must be some compensation for the shortening of the bar C. If the material is ductile and one that will stand bending, deformation or warping will occur. If it is non-malleable, such as cast aluminum and cast iron, and cannot stand distortion, a break will occur. Quite frequently a break will occur in those metals which are ductile at ordinary temperatures but whose strength is very low when hot. Copper is a metal which possesses this peculiar feature.

The entire piece can be raised to a high temperature as referred to previously and in this way one can produce an expansion in the entire mass and also a subsequent equal contraction. However, this is not necessary, and in some cases it is not possible. This operation also requires more time and is of a higher cost than if other means were used.

In the example referred to the application of preheating burners at the points B and D will cause the frame to expand in the direction of the expansion and contraction produced by the weld. Therefore, when the weld is finished and the frame starts to cool and contract, the parts B and C—inasmuch as they were raised to practically the same temperature as the metal surrounding the weld—will contract with the welded section, and the strains will be practically removed.

If it is impossible to apply preheating at the points referred to, another method may be used. By the use of jacks, wedges, or similar devices the casting may be sprung or bent out of shape, as shown by the dotted line, Fig. 9, and the edges

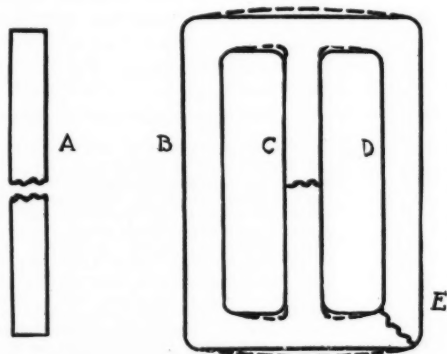


Fig. 9—Expansion and contraction must be taken into consideration when welding C, while A is free to expand



Fig. 11—Welding cylinder in preheating furnace

of the part to be welded separated. After the weld is executed and it is cooling, the jacks, wedges, etc., may be withdrawn; and in this way return of the sprung parts to their original positions will compensate the contracting strains.

Another method is that of breaking the piece at some external point, such as E. In this case the expansion and contraction will be free to act at the point C without any fear of serious after effect, as the casting is free to spring in any direction because of the loose point at E. As the point is not confined, it is an easy matter to reweld the break without fear of any bad results. This method, however, is dependent upon the thickness of the metal and is not a method that should be attempted unless all other means are not practical.

While this diagram is extremely simple, nevertheless, the principle to be considered and the methods of handling are identical with those experienced in all practical work. A clear conception of the forces acting, the nature of their action and how to counteract them is essential in attempting work of any kind with the oxy-acetylene blowpipe. It is true local conditions and the composition of the metal will influence the handling of expansion and contraction, yet the difference will only be that of application rather than principle.

In welding two plates it is necessary that the edges to be welded diverge as shown in Fig. 10. The amount of this divergence is dependent, to some extent, upon the thickness and nature of the metal. It is safe to say, however, that this divergence must not be more than 6 per cent or less than $2\frac{1}{2}$ per cent of the length of the weld. Some operators stick by the hard and fast rule of $\frac{1}{4}$ in. per foot. This is a fairly good figure. Yet, to obtain the best results, certain deviations from this proportion should be made.

In making a butt weld of two plates, the edges of which have been placed in contact with each other for their entire length, they diverge at first and then gradually come together until after about half of the weld has been made, when they will be parallel again. From this point on they will start to converge until there is an overlapping as shown in Fig. 10.

There are two methods of overcoming this: First, by diverging the plates the proper amount; second, by tacking or spot-welding the joint at various points. The second method has the disadvantage of causing warping or buckling under certain conditions. In several cases the warping or buckling can be eliminated by rolling or hammering after the piece has been welded.

The first method is by far the most satisfactory, and after the welder has had practice he accurately can calculate the amount of divergence the plates will need to bring the edges of the weld exactly together at its completion.

Garage Planning

Service Station Arrangements

No. 76

Garage on Two Streets

Q—I am about to build an up-to-date garage on the two streets and would like plans as to arrangement of the interior.—B. C. Witterling, Larimore, N. D.

Forty feet is not enough space to make a good garage for renting or storage purposes. It can be used very nicely for a repairshop or service station, though the latter should have more width if possible. We would advise you to move your repairshop over 10 ft. if it is at all within reason, and if that is impossible add 10 ft. to the width behind the shop.

Cars are not elastic and require just so much space. Of course, if you could move them about like dominoes no aisle or maneuvering space would be needed,

but unfortunately this is not the case. Most of the cars stored in a garage are 14 to over 16 ft. in length and need lots of room to turn. If you haven't the ample space customers will go to some other garage where they won't run so much risk of smashing someone's fenders or their own.

Then, too, if you haven't aisle space enough to make a turn and get a car in square, a lot of space is wasted, as at A-A-A-A and B-B-B-B. To demonstrate this point twelve 16-ft. cars can be stored in the 80-ft. space back of the shop, while with your proposed width of 40 ft. 16-ft. cars could only be stored by placing them diagonally, and not more than twelve could be stored in the whole 140 ft. You might be able to juggle the smallest cars, as Fords, etc., in the space beside

the shop, setting them at right angles, and still get them in and out without the use of skid jacks.

We will not attempt to make any shop arrangement, as you no doubt have that in operation now. Usually, however, when a business is expanded the units have to be rearranged, and if your old shop is not laid out to suit your new requirements, you would save money by doing it at once, even if you lose business while doing it.

No. 77

Storage Sales and Repairs

Q—I am submitting sketch of the size of a garage I contemplate building and will appreciate assistance given me as to the arrangement of doors, windows and interior.

There can be only one entrance, as there are buildings on both sides and the railroad at rear of lot. I want building to cover entire front 100 ft. and only 60 ft. deep, leaving 10 ft. space between rear wall and railroad. The building will be of brick and only one story, no basement.

The points on which I want information are the showroom, workbenches, two pits and washpit, men's toilet, office and parts room. There will be only two men in repairshop, and all storage will not be over twenty cars in this building.—C. J. Shoaf, Rocky Mount, Va.

It would seem advisable to divide your lot into approximately 50-ft. sections, giving one side over to storage and the other to sales and repairs.

We have not shown a very large repairshop since you contemplate employing two men and they usually will work on one car together. If you have a large room, it will serve only as an accumulating place for unfinished jobs.

The garage will have room for eight or nine full-sized cars on each side of the aisle and for five back of the left row in front of the shop. Of course, a passageway can be maintained through here except in emergencies, and these emergencies will come at night when the shop is closed anyway.

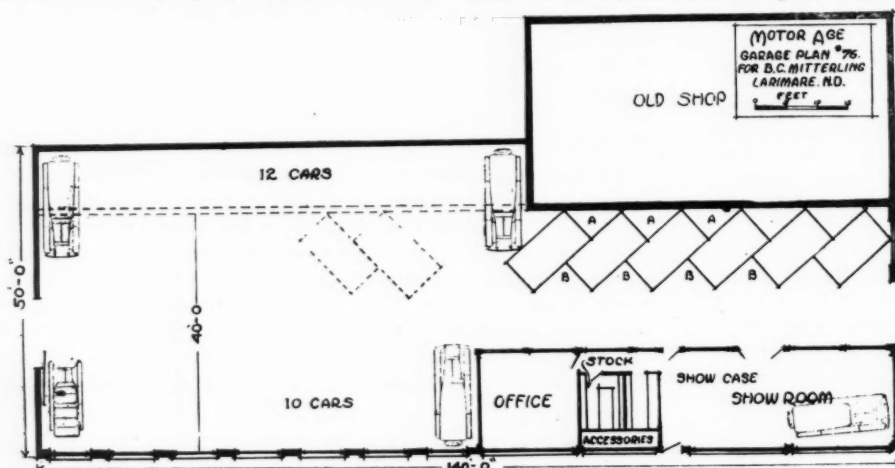
The garage roof should be supported by trusses somewhat as indicated, but the other half may rest on the room partitions, thereby saving considerable expense.

No. 78

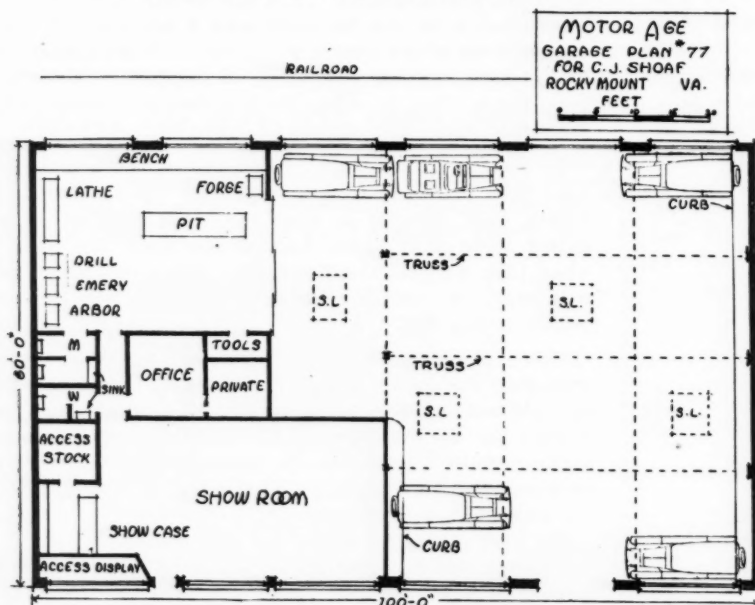
Center Entrance in Garage

Q—Our garage will be constructed to the following general specifications: 2½ by 12-ft. concrete footings, 16-in. concrete walls 10-ft. high, cement floor in basement, frame partitions in basement, hollow tile and brick veneer wall for first story, face brick for front, self-supporting roof for first story, wood beams and post for support of first floor, matched plank flooring for main floor, four-ply built-up roofing No. 1 hemlock ship-lap for roof sheeting, doors and windows as you may advise, full glass front, and as much light from the west end as it is possible to make it.—H. Sherman, Sherman Auto Co., Cumberland, Wis.

The center entrance in a garage is not desirable unless you have an exclusive



Garage on two streets with rather narrow space



Garage divided into sections for storage, repairs and sales

storage business. Then a very small office is necessary and accessories may be shown in the front of it. When cars are shown and accessories too, more room is needed to make a good layout than can be had on either side. Not that there is not enough actual space, but a better impression is created if your new cars are right with you in the office and there is closer and more intimate contact between yourself and the customer and the new cars and the accessories. If he comes after, or to see, one, he is bound to see one or all the others before he gets out. He might come to buy a spark plug and stumble over a new roadster or sedan that he simply could not live without. This is an exaggerated example to be sure, but such things do happen if they have an opportunity.

The shop would be better extending along the side of the basement than as you have it, as 25 ft. is enough width and more would only become littered up with discarded parts, etc., whereas it could be utilized to advantage as car storage space. The posts in the basement are spaced 14 ft. on centers, giving room for two cars between. They could be spaced evenly across the width but are better as we have shown with a wider space in the center.

If your city ordinance will permit, we think it would be an advantage to place the coal bin under the sidewalk and use the space at A for car storage, otherwise the 14 ft. strip or an 8 or 10-ft. strip extending across would contain the coal and heating plant. With your plan the square room cuts into the basement so far as to make the space left rather inaccessible.

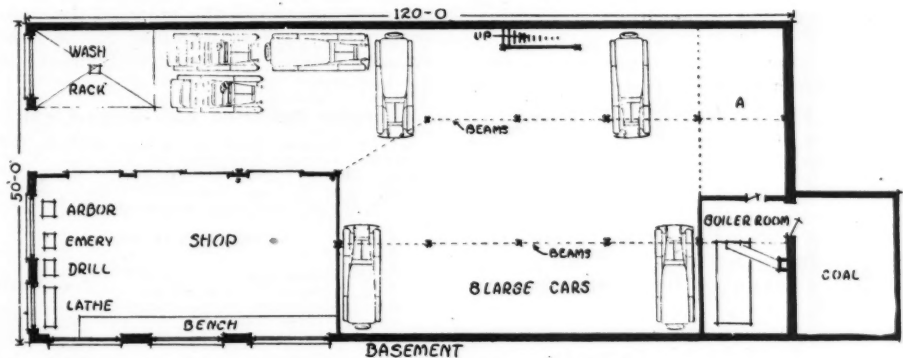
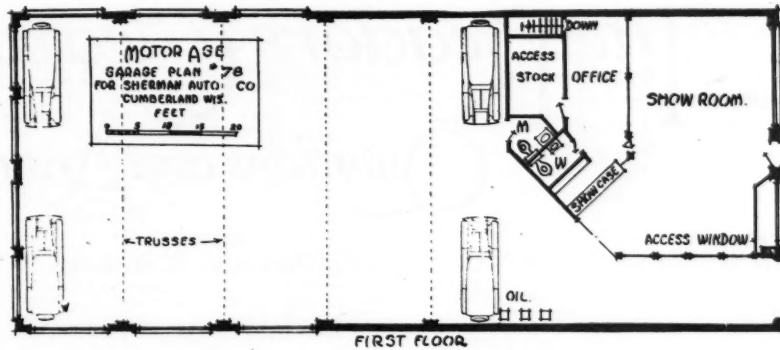
The location of the washrack near the entrance is also advantageous, giving ample light and more accessibility. In your location washing would have to be by artificial light entirely.

TO MAINTAIN CORPS SEPARATELY

Washington, July 4—Conferees on the Army appropriation bill for 1920 have included provisions for a bill which will have the attention of Congress shortly whereby the Air Service, Motor Transport Corps and Tank Corps will be maintained as distinctive organizations until June 30, 1920. There was a tendency on the part of some congressmen to abolish the Motor Transport Corps and place the purchase, maintenance and control of Army vehicles under the various Army divisions as was the plan prior to the war, but the economy and efficiency secured by the Motor Transport Corps resulted in the decision to continue this branch of the Army as a separate division.

A PERCH FOR EVERY CAR

Albia, Iowa, July 4—When the tired tourist rolls into Albia over the Blue Grass trail, which runs from Burlington, Iowa, to Omaha, he is attracted by the sign—Auto Roost, a perch for every car—over the main entrance of the McCreery & Taylor garage. When he alights and goes into the office to make arrangements to stay for the night he meets a pleasant faced woman in the



Basement and first floor plan of garage for Wisconsin firm

office, who quietly inquires what is wanted and after a few minutes' conversation the tourist discovers he is talking to Mrs. Deah Taylor, the Taylor of the firm that operates the garage. She has charge of the accessory end of the business, while Mr. McCreery looks after the outside work and the taxi line that is operated in connection with the garage.

Mrs. Taylor has been in the automotive business for the last seven years, and to say that she is a successful dealer is

MOTOR AGE is receiving many inquiries for garage plans which do not give sufficient information to permit an intelligent reply. There are certain things which should be known to lay out the proper plan for a garage, and inquiries are urged in asking for such plans to be sure to include the following information:

Rough pencil sketch showing size and shape of plot and its relation to streets and alleys.

What departments are to be operated and how large it is expected they will be.

Number of cars on the sales floor.

Number of cars it is expected to garage.

Number of men employed in repair shop.

And how much of an accessory department is anticipated.

putting it mildly, as the firm to-day has the agency for the Reo, Buick and Overland for their territory and a big share of the accessory and tire business of the Albia district.

No detail escapes her attention and "service with a smile" is practiced here as well as advertised. Many a tourist goes away with a pleasant recollection of the courteous and careful service received at the McCreery & Taylor Garage. The trade mark of the firm is a photograph of the seven-year-old daughter of Mrs. Taylor sitting in the center of a tire.

U. M. SERVICE EXPANSION

Detroit, July 4—The United Motor Service, Inc., which is the service branch of the General Motors Corp., is about to greatly extend its activities. The corporation now operates sixteen branches and by Jan. 1, 1920, seven more branch offices will be established, bringing the total up to twenty-three. The new places will be opened in Portland, Omaha, Dallas, New Orleans, St. Louis, Pittsburgh and Buffalo.

General offices will be maintained in Detroit under the supervision of Ralph S. Lane, president of the United Motors Service, Inc. In connection with this expansion, the United Motors Service will install retail accessory lines in all of their branches. According to President Lane, this does not mean that the company is going into a general accessory business but only that it will handle a few of the more technical and high-grade accessory lines. There are many accessories which require the technical and mechanical backing, such as the United Motors Service, Inc. is capable of supplying.

The Readers' Clearing House

Questions and Answers

Double Ignition on Marmon

Q—Would it be possible to install a double ignition system in a 1912 Marmon?

2—Would this increase the efficiency of the engine?

3—If this system of ignition is possible, publish diagram of it. The car is equipped with Bosch DU4 magneto.—A. Lynn Dickson, LaPlace, Ill.

1—By changing the ignition to a two-spark Bosch type ZR instead of the DU you can make a double-spark system.

2—Yes, the power and efficiency of the engine would be increased materially.

3—The Marmon 32-40 of 1912 driven by Joe Dawson in the Vanderbilt race was equipped with a Bosch two-spark ignition magneto, and this is shown in Fig. 1. The diagram for the wiring is shown in Fig. 1 also.

Break Leaked Current

Q—Some time ago I had a Hudson Super-Six that was giving trouble. On examination I found the car was very hard to start but ran almost perfectly after getting started. The trouble was a broken down coil. Why should this car start hard but run good after getting started?—W. B. McClellan, Auburn, Iowa.

The break in the coil was allowing the current to leak out. At low speeds this electrical leakage was more than enough to rob the ignition system of its due amount of current. At high speeds the leak was not large enough to consume the full output of the coil, and since the ignition system does not need all the current generated at these high speeds there was enough left to drive the car.

Ammeter Shows Discharge Only

Q—The ammeter on a 1918 Hupmobile with Bijur system does not show charge but shows discharge when it should. The battery gases good and stays up to a good charge. When the switch is turned off by shorting any one of the generator brushes to outside of generator it flashes. Should the generator do this?—F. E. Bilyen, Scotia, Neb.

The reason for the ammeter not showing charge when it should will be found in the ammeter itself. It is not advisable for anyone but the factory to repair a meter. There is nothing unusual in the sparking of the wires at the brushes when the switch is turned off, for the switch does not control this part of the circuit. Shorting any brush to the generator frame will cause the battery to be short-circuited, and this will cause sparking and severe injury to the battery. The switch is a lock on the ignition system only.

Charging Batteries with Generator

Q—Will a 12-volt generator charge two 6-volt batteries at once, generator being run as shown on page 31 in June 12 issue?—Fred Harlin, Itasca, Tex.

Yes, a 12-volt generator can be used to charge two 6-volt batteries. The batteries should be connected in series, negative two positive and the unit thus

Conducted by B. M. Ikert

The Electric System

made, connected to the poles of the generator, the positive terminal of the generator leading to the positive terminal of the battery.

Charging Batteries with Delco-Light

Q—Show best way to install system for charging storage batteries on 110-volt D. C. 3-k.w. Delco Light system with bank of lights, one to ten batteries from cars.—John E. Droh, Freistatt Motor Co., Freistatt, Mo.

The best way to charge one battery from a system is not always the best way to charge ten or twelve batteries. For charging one battery you can connect in series with the battery several lamps and connect this to the line. The lamps should be in multiple and the group in series with the battery. If 50-watt lights are used, it is usual to estimate about $\frac{1}{2}$ -amp. to a lamp. For one battery the charge can begin at about 6 amp., or twelve lights in multiple, and finish at about 2 amp., or four lights.

For ten or twelve batteries the problem is different, because the batteries

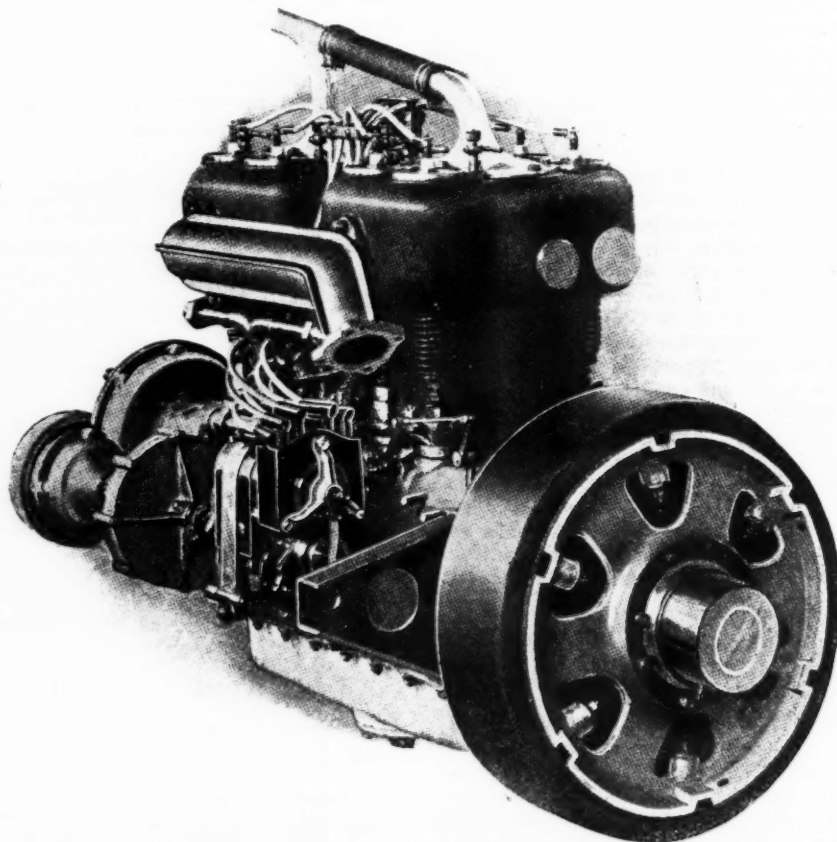
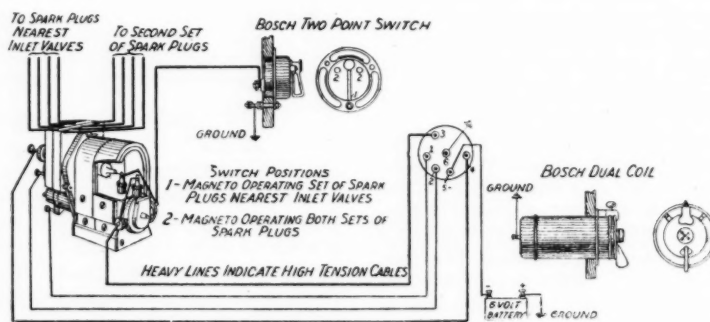


Fig. 1—Bosch two-spark magneto on Joe Dawson's Marmon racer, with its wiring diagram

themselves produce about 60 or 70 volts, and this must be opposed by the line voltage. A variable resistance made of iron wire wound around a 2-in. pipe and insulated from the pipe by a sheet of asbestos, with a variable contact, is better than lamps. With a resistance of this kind it is only necessary to connect an ammeter in with the circuit and slide the contact to the place where the meter registers about 10 amp. Then as the charging progresses the contact can be moved back and the charge decreased.

Essex Electrical System

Q—Illustrate the connections of the electrical equipment on the Essex.

2—Show internal diagram of starting motor and generator on this car.—George Wilford, San Antonio, Texas.

1—The Essex electrical system is shown in Fig. 5. The system is Delco.

2—The internal diagram of the motor and generator is shown in Fig. 4.

New Ford Wiring

Q—Publish wiring diagram of the new Liberty starter now being put on Ford cars.—A. L. Casburn, Ferris, Ill.

If you mean the standard system that is being furnished as stock equipment on the Ford sedans and coupelets, this is shown in Fig. 2.

Reversing Magneto Rotation

Q—What must be done to a Bosch magneto model DU4, variable spark to make it run in the opposite direction?—P. M. Perry, Richwood, Ohio.

You can make the change from anti-clockwise to clockwise by putting on a complete contact breaker assembly for right-hand magneto. Also the segments or cams will have to be changed, as you mention. To complete the job it is necessary to remesh the gear on the rear of the armature and distributor gear wheel so the break occurs with the armature in the position shown in Fig. 3. The distance should be from 14 to 17 mm. The illustration is made viewing the magneto from the driving end. The distributor gear will rotate in an opposite direction from what it did before the change, hence the wires going to the

To assist readers in obtaining as a unit all information on a certain subject MOTOR AGE segregates inquiries in this department into divisions of allied nature. Questions pertaining to engines are answered under that head and so on.

THE ELECTRIC SYSTEM

A. Lynn Dickson.....LaPlace, Ill.
W. B. McClellan.....Auburn, Iowa.
George W. Baadte.....Andover, S. D.
Fred Harlin.....Itasca, Tex.
F. E. Bilyen.....Scottia, Neb.
John E. Droh, Freistatt Motor Co.....Freistatt, Mo.
George Wilford.....San Antonio, Tex.
A. L. Casburn.....Ferris, Ill.
Harry P. Rumbo.....Wilkinsburg, Pa.
P. M. Perry.....Richwood, Ohio.

ENGINES

C. O. Lundeen.....Haxtim, Col.
J. C. Whitworth.....Pasadena, Cal.
K. E. Simmons.....Spokane, Wash.
Mich Labik.....McGee's Mills, Pa.
Ivan Parker.....Augusta, Ga.
H. E. Cullen.....Memphis, Tenn.
Fred K. Tarrant, Motor Sales Co.....Yuma, Ariz.
H. L. Bock.....Hanford, Cal.
M. H. Elder.....Atlanta, Ga.
A. C. Gunderson.....Newell, S. D.

CARBURETION

E. F. Isenberg.....Devol, Okla.
Reader.....Shreveport, La.
Howard T. Dimick, Shreveport, La.

MISCELLANEOUS

J. S. Kirk.....Broeton, Ill.
M. L. Jackson.....Duluth, Minn.
J. J. Kavan, Jr.....Linwood, Neb.
Star Garage.....Jonesburg, Mo.
L. E. Jones.....Quebec, Canada.

REBUILDING

Louis Weiss.....Graham, Tex.
J. W. Ratley.....Houston, Tex.
E. G. Williams.....Sioux Falls, S. D.
B. E. Inbody.....Sharpville, Pa.
F. E. Kreybill.....San Francisco, Cal.
Reader.....Waupun, Wis.
George F. Miller, Overland-Knoxville Co.....Knoxville, Tenn.
E. A. Stewart.....Los Angeles, Cal.
C. E. Hall, Auto Sales Co.....West Point, Miss.
F. J. Murphy.....Pittsburgh, Pa.
E. C. Penrose, Penrose Garage.....Newark, Ohio.

No communication without the writer's name and address will be answered in these columns.

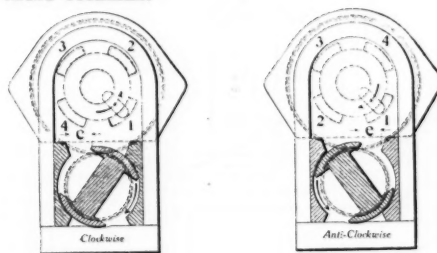


Fig. 3—Diagram for reversing armature on Bosch magneto

plugs must be interchanged so the cylinders will fire correctly.

The numbers 1, 2, 3 and 4 do not represent the firing order of the engine but the order in which the carbon distributor brush makes contact with the metal segments, according to whether the magneto is running clockwise or anti-clockwise.

Wiring of Buick

Q—Publish wiring diagram of a model D34 four-cylinder Buick, showing manner of connecting ammeter.—Harry P. Rumbo, Wilkinsburg, Pa.

The diagram for this is shown in Fig. 6.

Engines

Piston Rings on Oakland

Q—What size piston rings are fitted in the 1910 30-hp. Oakland, model 25.—C. O. Lundeen, Haxtim, Col.

This model Oakland uses 4-in. rings, 5/16 in. wide.

Using Telephone Receiver

Q—Explain the method of using an operator's telephone receiver for the detection of engine trouble?—J. C. Whitworth, Pasadena, Calif.

This can be done by securing a hardened steel rod about 1/8-in. in diameter to the end of the small telephone receiver, which magnifies the noise greatly.

Overland Engine Knocks

Q—A 1916 Overland, model 83, with Stromberg carburetor K, has good compression but does not pull well on hills. It knocks loudly when pulling hard on high gear on grades that it would make without much of a run. Retarding spark helps some on a pull but not sufficient. Will this carburetor give satisfactory results with present-day gasoline?

2—Would heavy oil help power? I am using light oil.—K. E. Simmons, Spokane, Wash.

1—We do not believe the carburetor is causing your trouble but rather that there is something loose in the engine. If the sound is loud and of a heavy thumping nature, then it is probably a loose main bearing. This can be remedied by taking up on the bearing slightly after removing a shim or two from between the bearing caps.

2—A medium oil is best for summer use. It is wrong to try to correct mechanical trouble of this kind by attempting to muffle the noise with a heavy oil. The heavy oil will not lubricate some part where bearing pressure is high as well as a medium oil. A main bearing is one of these.

Why Engine Carbonizes

Q—What causes excessive carbon to form in the engine? The spark plugs get fouled very quickly.

2—What is the best; an exhaust horn or an explosion whistle?

3—How does gasoline get into the crankcase?

4—How wide are the piston rings in the Overland 85?

5—How many miles per gallon of gasoline should an Overland go?—Mich Labik, McGees Mills, Pa.

1—Excessive carbonization is caused by oil leaking by the piston up into the combustion chamber and by a rich mixture. If the spark plugs foul with a soft, sooty carbon deposit, then it is a sign oil is leaking by. If the carbon on the plug is of the rock carbon kind, hard and brittle, then the carburetion is at

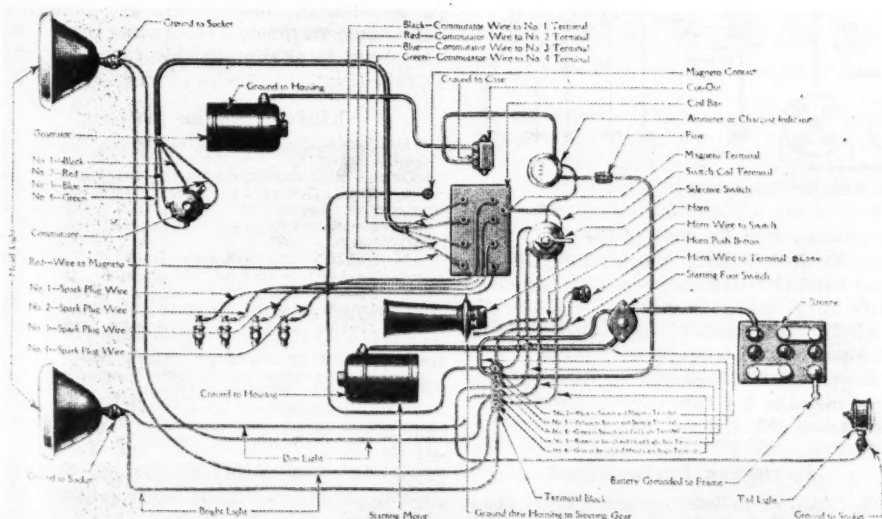


Fig. 2—Wiring diagram of starter used on Ford cars

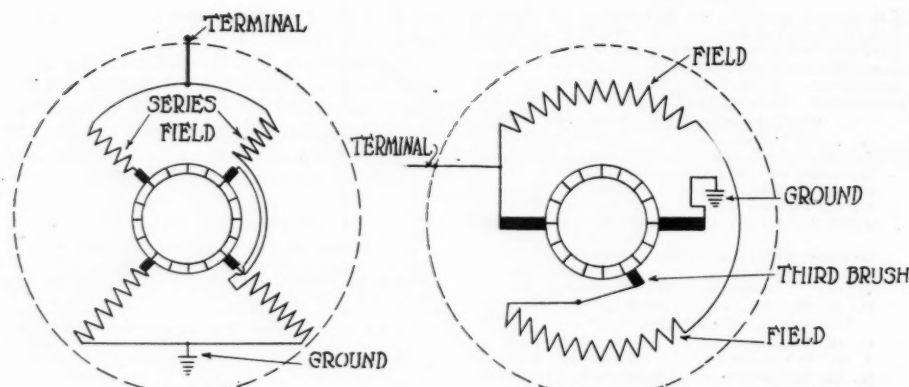


Fig. 4—Internal diagrams of the starting motor, left, and generator, right, on the Essex car

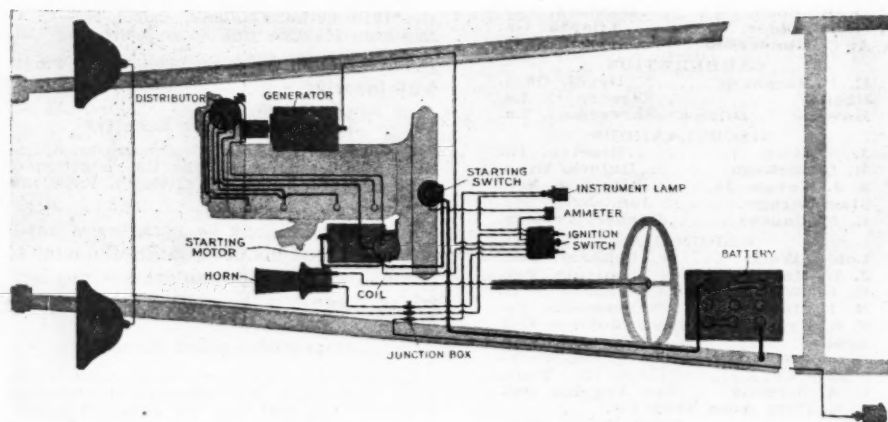


Fig. 5—Wiring diagram of the electric system on the Essex

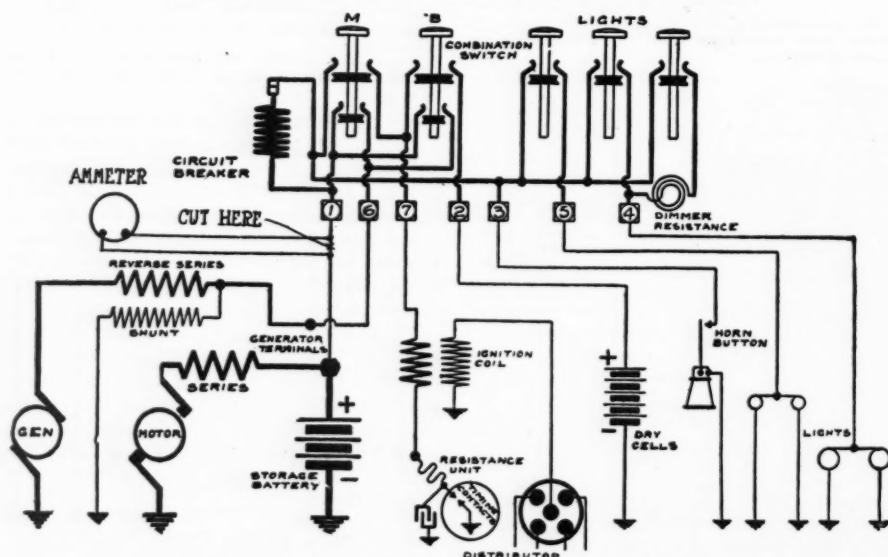


Fig. 6—Wiring diagram of Buick, with ammeter connections

fault. A broken ring or a scored cylinder will cause the oil to leak by. If caused by the carburetor, the proper adjustment will correct it.

2—If an explosion whistle maintains a perfectly tight joint at the valve when not in use, then it is more effective as a warning device, because it works under a higher pressure. The exhaust horn, though, will not work injury upon the engine if it is not tight.

3—Because of faulty carburetion or else operating with a cold engine. People making short drives and frequent stops are troubled with this difficulty

more than ever because of the fuel. Fuel steadily is becoming worse, and the engine must be extremely hot to successfully burn it.

4—The Overland 85 uses $4\frac{1}{2}$ by $\frac{3}{8}$ -in. piston rings, two rings per piston.

5—Anything above 16 or 17 m.p.g. is good mileage for this car, or for any car its size.

Increasing Engine Speed

Q—This six-cylinder engine runs about 2200 or 2300 r. p. m. and I wish to make it run about 3000 or more. How is the best way to do this?—Ivan Parker, Augusta, Ga.

The limiting features in the speed of an engine are: Poor scavenging at high speed, resulting in low volumetric efficiency, and excessive vibration, which absorbs energy. It has been found by experiment that an engine operates best when the velocity of the gas in the manifold is about 13,000 ft. per minute. Your engine, running about 2200 r.p.m., no doubt was designed to meet this condition. Now if the speed is to be increased to 3000 r.p.m., the size of the manifold must be increased so the gas velocity at this speed will still be about 13,000 ft. per minute. To do this the manifold must be enlarged, the valves must be made larger and the lift higher. The vibration of the engine can be reduced by fitting lightweight pistons and rods and a balanced crankshaft. The shaft must be balanced while it is running. A six-cylinder shaft with its pistons and rods is in natural balance, but if the shaft is not sufficiently rigid, a torsional vibration will be set up and it is this that must be counteracted.

Liberty Engine on Speedster

Q—Would it be possible and practical to mount a Liberty aviation engine on specially constructed frame for a speedster?

2—About what would be the speed of the above?

3—How many miles could be obtained from a gallon of gasoline?

4—What is the fastest American-built stock car?

5—Which is considered the fastest, the Craig-Hunt or Laurel sixteen-valve-head for Fords?—H. E. Cullen, Memphis, Tenn.

1—Ralph de Palma's Packard 905 is equipped with an aviation engine which embodies virtually all the features of the Liberty engine. This car has gone 150 m.p.h.

2—Unless your speedster is very carefully designed a Liberty aviation engine will do it very little good. The maximum obtainable speed is dependent upon many conditions. The body design, for one thing, at these high speeds is of paramount importance.

3—We do not know the exact gasoline mileage, but the Liberty engine under full load consumes about 20 gal. per hour.

4—This cannot be answered exactly, for there have been no competitive stock car races for several years.

5—Both of these heads are made for the same purpose. The racing-type Laurel head is similar in this respect to the Craig-Hunt.

Kinds of Engine Balance

Q—State the different kinds of balance an engine must be in to be said to be in perfect balance, and explain what is meant by each.

2—Generally speaking, which is the better-balanced engine, a four-, six-, eight- or twelve-cylinder, granting that all are carefully built?

3—Publish the Robert's formula for finding the horsepower of an engine.

4—Publish the power curve or give the actual drawbar pull in pounds of the 20-40 Case, 15-30 Titan, 25-50 Avery and 26-44 Wallis.

5—Would $\frac{1}{4}$ -in. large valves make a noticeable difference in the power or speed of a Ford engine. Will smoothing the interior of the intake manifold on a Ford improve the performance of the engine?—Fred K. Tarrant, Motor Sales Co., Yuma, Col.

1—An engine is in perfect balance when it is statically and dynamically balanced. The static balance generally is referred to in connection with the shaft, when it is standing still. If the

shaft is supported on knife edges and balances perfectly then it is in static balance. However, if a shaft is balanced when standing still, it is no sign that it will be in balance when in motion. The engine as a whole is in static balance when all the reciprocating parts weigh the same and the shaft is in balance on knife edges. As soon as the engine is set in motion inertia forces are set up and tend to distort the smoothness of operation.

2—In a four-cylinder engine the inertia forces set up produce harmonic vibration in periods of crankshaft speeds, the first one being at twice crank speed. There are other components of gradually diminishing amounts as the speed of the component becomes greater. Thus, the component occurring at about four times crank speed is hardly noticeable in the fifth or sixth decimal place. The six-cylinder engine is inherently balanced. Its harmonic vibration forces neutralize each other. However, the six-cylinder engine is subject to torsional vibration, and if the crankshaft is not stiff and rigid, it will cause the engine to vibrate as if everything in it were loose.

This is one reason why companies point with pride to the heavy and well-designed shaft their product uses. The eight-cylinder engine is practically two fours coupled together. The four-cylinder vibration is vertical but in the eight the vibration is horizontal and equal to 1.4142 times that of either of the blocks acting independently. The twelve-cylinder engine is in perfect balance, because it is made of two sets of six and each set in balance. The torsional vibration effect is present though. This is the reason for the vibration damper on the end of the Packard crankshaft.

3—Robert's formula for gas engine horsepower is:

$$D^3 L R N$$

$$18,000$$

where D is the bore in inches, L is the stroke in inches, R is the r.p.m., and the N the number of cylinders.

4—The Case 20-40 has a drawbar pull of 4200 lb. at pulling speed; the Avery 25-50, 4800; the Wallis three-plow, 2000 lb. pull constant at running speed.

5—Yes, larger valves make a noticeable difference in the power of an engine. Dodge Brothers engine valves can be fitted very nicely to a Ford engine, if the seats are reamed out.

Adjusting Mercer Timing Chain

Q—How is the chain in a Mercer 22-72 engine tightened?

2—Will a new carburetor help enough to pay to install one?

3—How many cars have a guaranteed speed?—M. H. Elder, Atlanta, Ga.

1—Any slackness of the camshaft driving chain is taken up by a spring-operated eccentric idler. This adjustment, it has been found, needs attention once about every 10,000 miles. If after this distance it is found the spring has taken up all the play possible with the eccentric, one link of the chain should be removed. The idler then should be brought back to its original position and the chain re-assembled. The timing of the valves should be checked after the chain

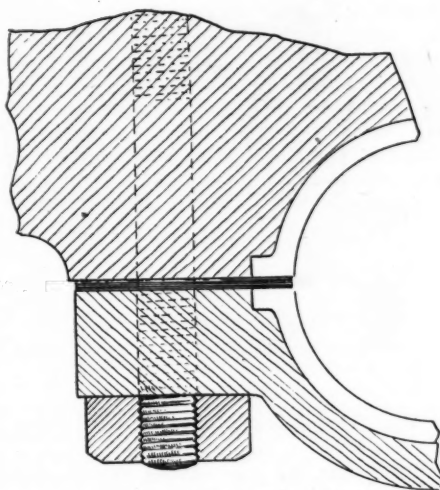


Fig. 7—Bolt which holds bearing

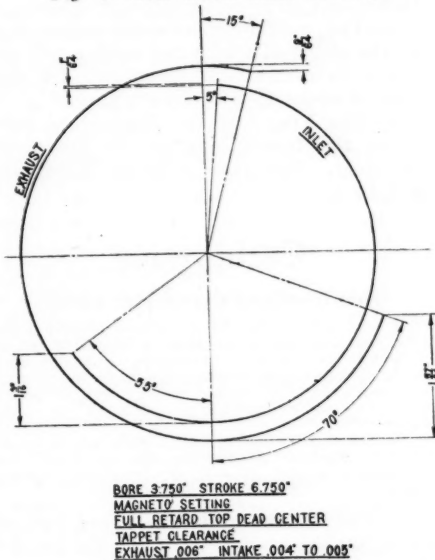


Fig. 8—Timing diagram of Mercer

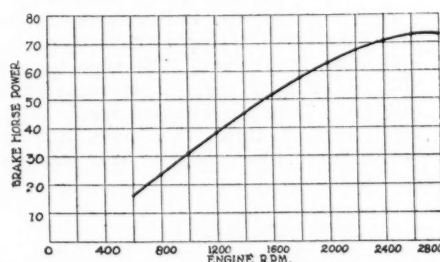


Fig. 9—Horsepower curve of Mercer

is shortened. The correct timing diagram is shown in Fig. 8.

2—If the carburetor is several years old, then it is wise to install a new one, for fuel conditions rapidly are becoming worse. Carburetors of three years ago were designed for gravity fuel of 65 or better. But now, while gravity tells nothing about the fuel because of the way it is made, it measures nevertheless much less than 65, and in one case the writer made a test of some fuel measuring 48 deg. Baume.

3—One, to our knowledge, and that is the Mercer; 80 m.p.h. for the speedster.

May Be Crankcase Leak

Q—What is the average speed of the three new Studebaker models?

2—What is the most powerful six-cylinder machine made under \$2,000?

3—What company makes a warning signal operating from the exhaust gas and sounding much like a pipe organ?

4—This Studebaker four uses nearly a gallon of oil to 100 miles. It runs good, rings are good, valves have just been ground and bearings are in good condition. What is the trouble?

5—One bearing tends to loosen all the time in this Studebaker and cannot be remedied in the garage in town. What causes this and how can it be remedied?—H. L. Bock, Hanford, Cal.

1—Studebaker does not guarantee a speed, but the Lig Studebaker when in perfect mechanical condition and all other things favorable should make about 65 m.p.h., the light six about 55 and the four about 50 m.p.h.

2—The car having the highest rated S. A. E. horsepower and listing under \$2,000 is the Studebaker model EG. The engine on this car has a bore and stroke of 3 3/8 by 5 in., giving it a rated horsepower of 36.04 at a piston speed of 1000 ft. per minute.

3—Exhaust chimes of this type are made by the Gabriel Mfg. Co., 1407 40th street, Cleveland, Ohio, and by the Randall Faichney Co., 76 Atherton street, Boston, Mass.

4—This oil consumption is rather heavy and there probably is a leak somewhere in the crankcase. It might be the gasket between the bottom pan and the case is marred. This will allow the oil to drip out very rapidly in comparison with excessive consumption caused by scored cylinders. If the cylinders are scored, you will notice the continuous smoky exhaust, but since you do not mention this, we believe you will find a leak somewhere in the system.

5—The bolt which holds the bearing probably has become burred so the threads on the nut do not have a gripping surface on the bolt, such as Fig. 7. You can remedy this by turning the bolt out several threads from the upper bearing cap. This will give a new gripping surface for the nut. It might be after doing this the hole in the bolt for the cotter-pin will be below the castellations on the nut. If this is the case, then a steel washer above the nut will make up for this slight difference.

Horsepower Formula and Test

Q—Which motor car manufacturer uses the most powerful engine in actual horsepower on a regular stock car? Brake horsepower?

2—If the N. A. C. C. horsepower of, say, a Mercer is 22 and the car will develop more than 70 hp. at brake test, then the N. A. C. C. horsepower is nothing to go by.

Does piston displacement indicate anything as to horsepower of engine?

3—Which crankshaft speed does the manufacturer generally use in figuring the horsepower of the engines on brake test?

4—Which is considered the most economical engine on fuel, the short or the long stroke; both giving the same horsepower on brake test, four and six-cylinder?

5—What is the average crankshaft speed of engines as built at the present time?

6—Who puts out the highest-speed engine at the present time?—A. C. Gunderson, Newell, S. D.

1—The Winton, Pierce-Arrow, McFarlan and Locomobile cars use engines the rating of which is 48.60 hp. These cars have the most powerful engines when based on the N. A. C. C. formula. Actual brake horsepower ratings are not available, but some of these engines are supposed to develop more than 100 hp. on the block.

2—Your statement as made is hardly

correct, for it does not stipulate any limitations. The standard rating is made at a piston speed of 1000 ft. per minute. Fig. 9 is the horsepower curve of the Mercer engine. The Mercer with its 6.75-in. stroke must turn over 888 times per minute in order that the pistons may travel 1000 ft. in the same time. Now, at 888 r.p.m. the diagram shows that the engine is developing 26 hp., which shows that the engine is slightly improved over the conditions thought to exist when the formula was developed. If the engine did not operate any faster than 1000 piston ft. per minute, then this rating would be representative, but the engine is capable of running at a speed of 2800 r.p.m., which is equivalent to a piston speed of 3149 ft. per minute, or three times faster than that given by the rating. Obviously a one-speed formula cannot hold when applied to any speed of an engine. The N. A. C. C. rating gives a fair comparison of all engines when running at a piston speed of 1000 ft. per minute.

Horsepower as expressed by the N. A. C. C. formula is a function of the square of the diameter only. If the stroke also is considered, then the displacement is the factor under consideration. Considering the stroke, the horsepower is considered to vary as the 0.7 power of the stroke. To illustrate: An engine with four cylinders of 3 by 3-in. bore and stroke would develop, according to rating, 14 hp. But if an engine with four cylinders and 3 by 6-in. bore and stroke were considered, then the power output would be 1.626 times the rated power. The figure 1.626 is obtained by raising the ratio of the two strokes to the 0.7 power.

3—Brake horsepowers are determined on the testing block, and the figures taken for speed are the actual number of revolutions per minute the engine is making at the time, as measured by an automatic indicating tachometer.

4—Fuel economy is largely a measure of piston displacement. The larger the piston displacement, the more will be the fuel consumption. Of course, there are many things which affect this. Two engines with similar bore but different strokes will have the same horsepower

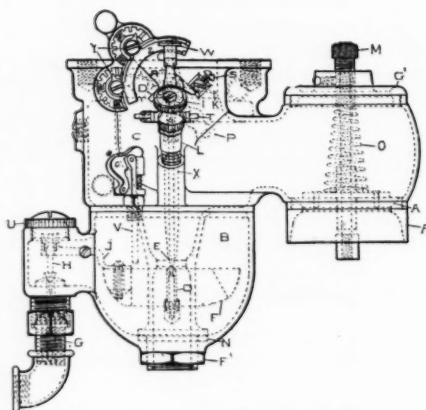
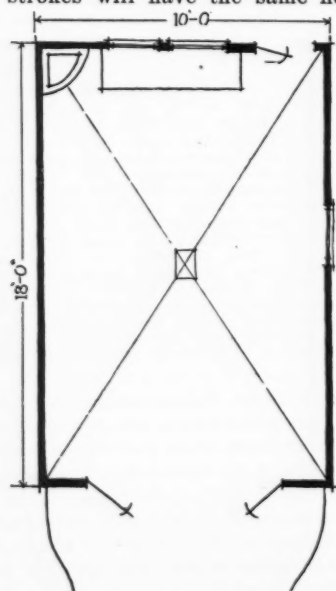


Fig. 11—Schebler carburetor on Overland

rating, but the one having the shortest stroke will have the least fuel consumption.

5—The maximum average speed, that is, the speed at which the engine will develop its maximum horsepower for this year is about 2800 to 3000 r.p.m.

6—The King and the Elgin cars have about the fastest engines in the stock car field. The gear ratio on these cars is 5 to 1.

Carburetion

This Overland Carburetor Floods

Q—An old model 37 Overland engine runs fine as long as it is kept going but when stopped the engine backfires, blowing gas back through the carburetor and causing it to flood. Is this caused by the engine being out of time or is it the fault of the carburetor?

2—Show illustration and give adjustment of the Schebler carburetor as used on the Overland, model 37.—E. F. Isenberg, Devol, Okla.

1—The engine probably is not out of time, but the carburetor is too old for the fuel. If you install some new-type carburetor you will get better results.

2—The carburetor is illustrated in Fig. 11. Two types of carburetors were furnished on these cars. The type L probably is on your car. It is adjusted as follows: Turn the knurled screw to the right until it stops, then open it about half a turn; open throttle half way and

start engine. Close throttle, setting it with the screw which runs through the lug on opposite side of the carburetor, until the engine is running at the slowest desired speed. By turning the knurled screw to the left or right the correct mixture for idle speed is obtained. When this has been determined, open the throttle until the little roller on the needle valve lever stands in the center of dial 1. By turning the indicator point between 1 and 3 the correct mixture for intermediate speeds will be obtained.

Next open the throttle full and turn indicator point on dial No. 2 between 1 and 3 and obtain adjustment for open throttle. If the mixture appears to be rich before making the adjustment on dial 2 replace the air valve spring with one of slightly less tension.

Using Heavier Oil

Q—Explain the effects of high atmospheric temperatures on the oil in the crankcase. For example, an engine in good condition, carefully run the first 1000 miles, which has not given any oil pumping troubles, suddenly with the advent of weather around 95 deg. gives signs of oil in the cylinders, and this is attributed to the thinning of the crankcase oil due to the engine heat plus the atmosphere. Is this correct, and does the temperature readily affect the oil in hot climates?

2—Is the use of heavy Veedol, Mobiloil, etc. good to overcome this condition?

3—What popularly are called explosions of gas in the cylinders are really combustions. Explain the difference from the heat expansion of gas in a cylinder when fired and the change that takes place when gunpowder in a cartridge is fired by percussion.—Reader, Shreveport, La.

1—Viscosity of oil is determined by the body and base of the oil. If in your climate the temperature is so hot the oil does not retain its viscosity, then a heavier oil should be used. Under operating conditions the oil should have a consistency equal to that of medium oil when at a temperature of about summer heat. If heavy oil is used to meet this requirement, the engine must be run very carefully until it is warmed up. The engine must not be raced, for when it is cold the oil is heavy and the oil pump will not pump enough oil to supply the bearings.

2—Yes. See 1.

3—The difference in the explosion within a cylinder and that within a gun is in the rapidity of flame propagation and the final volumes of the charge. Gunpowder and forms of higher explosives will expand in volume about 3000 or more times. The temperature during the combustion of the powder is extremely high. While the exact temperature is not known it is about 3000 deg. hotter than that within the cylinders of the gas engine. The rapidity of flame propagation in a cannon is almost instantaneous, while in a cylinder the burning takes place during an appreciable period of time.

Slight Peculiarities Unimportant

Q—What causes a missing or vibration in the front of an Oldsmobile six when throttling down to slow speeds with the spark still advanced? This vibration does not resemble the usual knock from a spark advanced too far but rather is like a missing at the plugs or an engine about to die under load. It is a jerk with a vibration that seems to be in the front axle. It ends when the spark is retarded. It occurs only at very low speeds on a pull or with a cold engine throttled down with advanced spark. The engine when warm will throttle down to

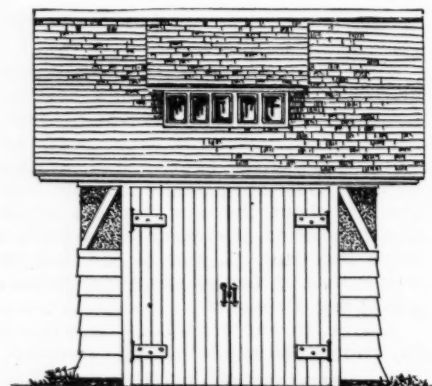


Fig. 10—Two views of private garage

3 m. p. h., run smoothly at that speed without a miss and run fine at high speeds when warm and has good power. The carburetor has been set for a very lean mixture and spits a lot until warmed; also the ignition has one peculiarity. The battery is 1.250. With spark half way on sector the engine will idle more slowly than when spark is retarded fully. At half-way idle the ammeter does not show charge. Is the trouble carburetor or ignition? The engine is clean, valves clean and everything O. K. The oil is drained every 1000 miles.—Howard T. Dimick, Shreveport, La.

It is our opinion that your car is in very good condition and that these slight peculiarities are the natural tendencies of a gasoline engine. This missing action which you complain of at slow speeds, with a cold engine, is caused by the incomplete carburetion of the fuel. The velocity of the mixture at the carburetor jet and in the manifold is naturally slow at slow speeds. With a cold engine the mixture is in the form of a spray, and the low velocity combined with this causes the heavier portions to be hurled against the outer periphery of the bends in the manifold. This causes an erratic action that makes the engine miss. At higher temperatures the fuel is not in the form of a spray but a finely divided mist or, as the carburetor manufacturer puts it, the mixture is a gas.

The fact that your engine idles better at a half spark setting than at a fully retarded setting is not surprising. The power required to run an engine must be in excess of that required to turn the engine over against compression. At these extremely slow speeds the power developed is very little in excess of this required amount. With the spark fully retarded the mixture does not begin to burn until the piston is well on its downward stroke. The loss in efficiency due to this is tremendous, and it has been proved that the mixture is still burning when the exhaust valve opens and continues to burn when in the muffler. The generator is set to start charging at about 8 to 10 m.p.h., so that at low speeds the ignition current is taken from the battery.

Miscellaneous

Has Unusual Noise

Q—A 1918 Ford touring car has a bad grinding noise when running at about 12 m. p. h. We have had the differential and transmission overhauled and have put in three triple gear bushings, transmission gear shaft, transmission driving plate assembly, three transmission band linings, transmission brake drum assembly, driveshaft, ball thrust collar, four axle roller bearings, universal joint assembly, driveshaft roller bearing housing, pinion gear and two axle bearing sleeves. We can disconnect the differential and hear the noise slightly connect it back up and the noise is increased 75 per cent, but it cannot be heard on the road, only in high running at about 10 or 12 m. p. h. What is causing the noise?—J. S. Kirk, Brocton, Ill.

After overhauling the drive assembly as completely as you have done and failing to make any noticeable improvement in the condition, it is rather hard to suggest a remedy without examining the car. There are a few things, however, not mentioned which it appears might be the probable cause. First check the alignment of the rear axle and its housing. It might be this has been bent and the pinion and ring gear, even though they are new, are not operating as they should. If the axle housing is not ex-

actly at right angles with the torque tube, a similar condition will arise. A good way to get at the seat of the trouble is to examine all moving parts with a stethoscope. This can be made by securing a hardened steel rod about 1/8-in. in diameter to the end of the small telephone receiver, this magnifies the noise greatly.

Determining Oversize Tire

Q—A four-cylinder Buick has 31 by 4 tires. Can 32 by 3 1/2 or 31 by 3 3/4 tires be used on the same rims?

2—What is meant by 4 to 1 gear ratio?

3—This car is gear 4.08 to 1. Is this geared high or low for a Buick four?

4—What speed should this car make?—M. L. Jackson, Duluth, Minn.

1—The change in tire size you suggest cannot be made. This is determined as follows: A wheel having a 31 by 4 tire uses a 23-in. rim. The figure 23 is obtained by subtracting two times the width of the tire from its diameter. Any oversize tire to be applied must use a 23-in. rim. So the next oversized tire for your car is 32 by 4 1/2.

2—When a car is equipped with a 4 to 1 gear ratio it means the engine turns over four times while the rear wheels turn over once.

3—The gear ratio in your car is the one put out by the factory and should be left as it is unless the car is to be used for a special purpose.

4—Your letter did not inform us of the car model. If you can do over 45 m.p.h. the car is in fairly good condition.

Troubled with Muffler Echo

Q—What causes drumming in a sedan, and how can it be prevented? It is more severe in a four-cylinder than in a six or an eight.—James J. Kavan, Jr., Linwood, Neb.

This noise is not described very thoroughly, but we believe you mean the noise which is apparently an echo of the noise from the muffler. This is very apt to be more pronounced if there are any leaky joints in the exhaust system before the muffler. It is possible to overcome this to a large extent by wrapping the muffler and the exhaust pipe with sheet asbestos. The asbestos should be wet when it is applied, because this permits of better contact between the asbestos and the metal. After the asbestos is applied it should be held in place with wire.

Suggestions from Star Garage

Jonesburg, Mo., Editor MOTOR AGE—We wish to make the following suggestions to Ferdinand Ehlert, Antelope, N. D., relative to Dodge propeller shaft vibrating as given on page 35 of June 26 issue. If he will examine the upper joint of the propeller shaft housing, he will find that it is one of the old-style

joints, that the noticeable vibration is due to the up-and-down motion of the torque tube and that the two yoke supports have worn elongated, which allows his propeller shaft to produce an up-and-down motion at slow speeds, which becomes less noticeable as the car speeds up, owing to a constant torque on the shaft.

We would also suggest to A. H. Isherwood, Chicago, who complains of coil trouble on page 40, that he look for his trouble in the condenser located in the breaker housing.

We have had years' experience as Dodge Brothers' dealers and service station, and during our connection with Dodge Brothers we have had cases identical with those mentioned in your paper concerning which we are now writing and have been successful in correcting the trouble.—Star Garage.

Garage for Private Use

Q—The writer wishes to build a garage for private use and would like suggestions or plans.—L. E. Joncas, Quebec, Canada.

A suggestion is shown in Fig. 10.

Rebuilding

Racing Car From Allen 37

Q—Publish diagram for changing a 1917 Allen 37 5-passenger car into a racer.—Louis Weiss, Graham, Tex.

A design for a race car using your chassis is shown in Fig. 12. It will be necessary to make several changes other than fitting a race body to make the car fast. For instance, the gear ratio will have to be changed, to about 3 to 1, the spark should be advanced. Then it is a good plan to fit larger valves, lighter pistons and a carburetor of some type popular with the race drivers.

Car Designed on Airplane Lines

Houston, Tex., Editor MOTOR AGE—Here is my design of a body constructed with an eye to airplane lines and practice. The chassis is 135 in. and has an underpan extending from the front axle to the rear axle; the fenders are attached to the axles and are fitted extremely close to the wheels; the runningboards are held by struts to the frame and have semi-circular holders for extra tires on each side of the hood. The engine is eight- or twelve-cylinder with exhaust pipes running into a single pipe on each side which turns down over the spare tires and is deflected out from the cowl. A lever at the driver's side works a device in the pipe to cut down some of the noise when in a city.

The body is built high on the frame

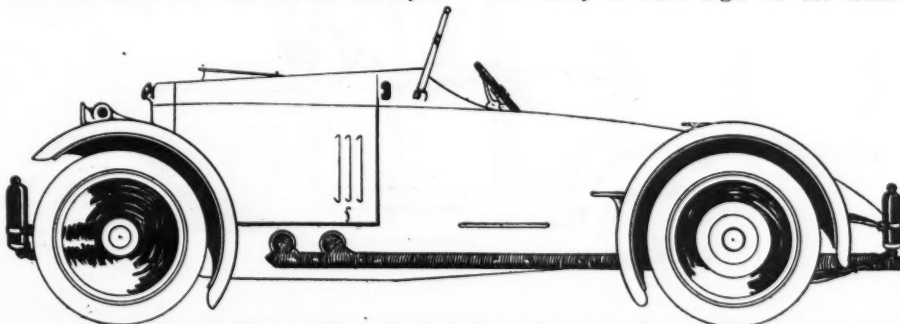


Fig. 12—Idea for racing design for 1917 Allen

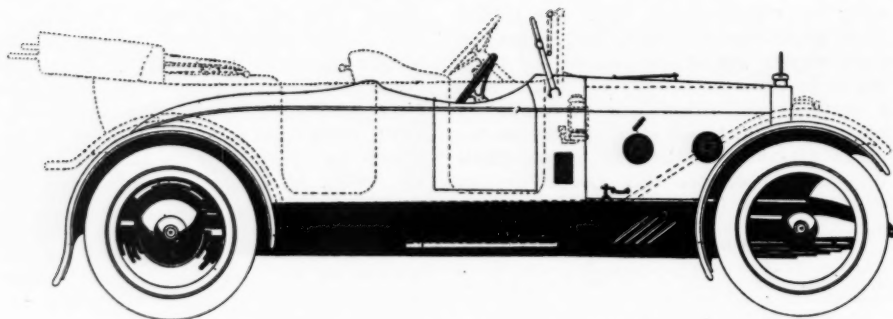


Fig. 13—Suggestion for roadster design for 1912 Pierce-Arrow

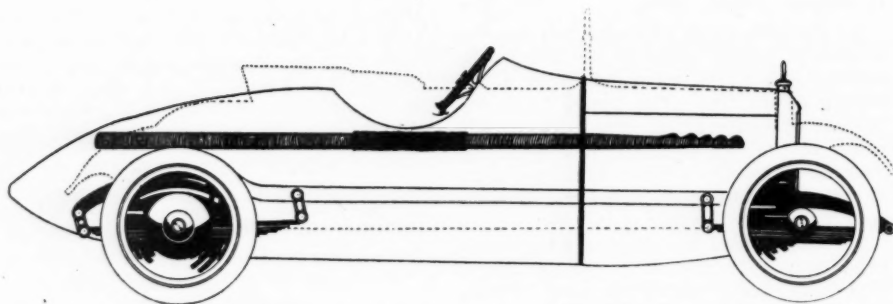


Fig. 14—Mercer with body similar to Mulford's Frontenac

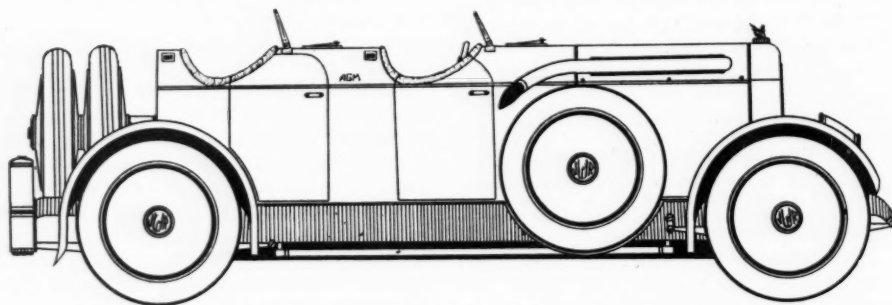


Fig. 15—Car designed by reader who favors airplane lines

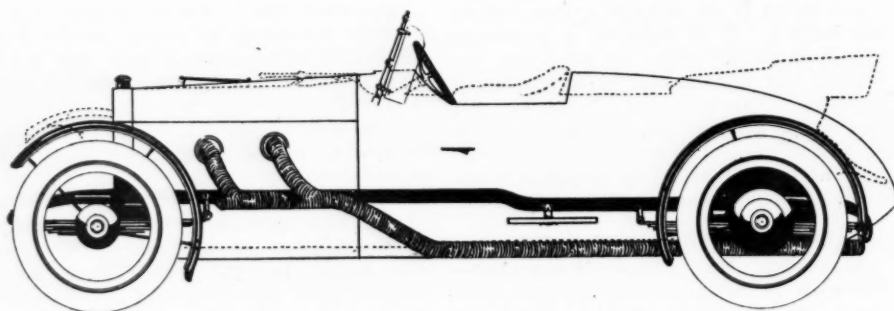


Fig. 16—Suggestion for rakish-looking Kissel speedster

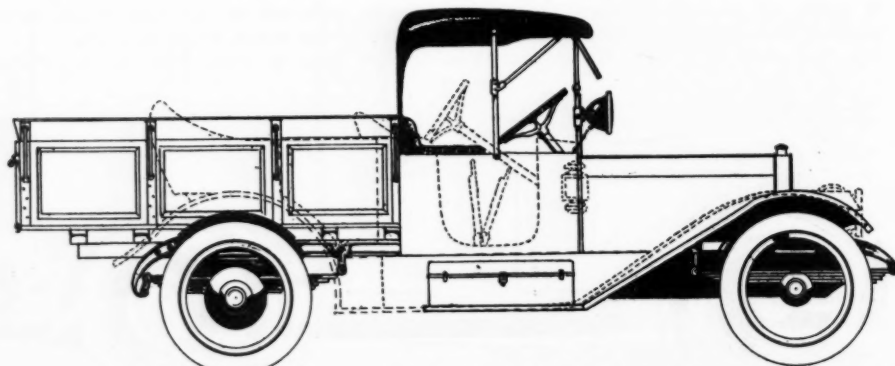


Fig. 17—How a farm truck might be made from old Winton

and has narrow openings for the passengers; the head and shoulders only are visible when they are seated in the machine. The edges of the compartments are padded in airplane fashion and the four seats are separate. A small windshield similar to the type used on the DeHaviland is placed in front of each seat and every passenger can adjust his shield to suit himself. Ventilators are placed on the tops of both cowlings; this is particularly necessary as the increased overhang excludes all ventilation except that coming from the ventilators.

In inclement weather small tops can be placed over both compartments by fitting a light framework into the small apertures just behind the seats; the car, however, is intended for use without the tops. Arrangement is made to carry a spare tire for each wheel; pneumatic shock absorbers and disk wheels are standard, and the headlights are dropped to the frame.—J. W. Ratley.

1910 Winton Changed to Truck

Q—How can a 1910 Winton be changed into a 1½-ton truck for farm use?—Joseph J. Hayes, Sedalia, Mo.

This is shown in Fig. 17.

Rakish Kissel Speedster

Q—Publish suggestion for covering a 1913 Kissel 6-66 into a rakish-looking speedster?

2—Give an idea as to how much this rebuilding would cost.—E. G. Williams, Sioux Falls, S. D.

1—The car is shown in Fig. 16.

2—If a rebuilder is to do the work, it should not cost more than \$500.

Likes Mulford's Frontenac

Q—Publish body design similar to Ralph Mulford's Frontenac for a 1914 Mercer roadster.—B. E. Inbody, Sharpsville, Pa.

This is shown in Fig. 14.

Pierce-Arrow Roadster

Q—Publish roadster design with deck to be mounted upon a 1912 Pierce-Arrow 6-36 chassis.—F. B. Kreybill, San Francisco, Cal.

This design is shown in Fig. 13.

Maxwell as Snappy Racer

Q—Publish sketch for converting Maxwell into a snappy racer, using the same radiator and hood. The dash should come well back, drop straight down and continue to seats, two tanks at rear, no tail.—Reader, Waupum, Wis.

Fig. 21 shows the car designed in accordance with your requirements.

Speeding Up a Ford

Q—Is it not impossible to gain more speed by placing a sixteen-valve-head engine on a Ford unless the stroke of the gear ratio in the differential is changed?

2—Give theory upon which it operates.

3—What carburetor is best suited for this cut-down model?

4—What kind of an ignition system or magneto is best suited?

5—What is the best method for undersliding the frame?

6—What is the best method in handling the front?

7—What is the best method in lowering frame in rear?

8—What mileage will be obtained from gasoline after placed in operation?

9—Will not the chain that drives the camshaft be giving constant trouble because of the distance between it and the crankshaft?

10—What speed can be obtained when completely remodeled?

The article I refer to is on page 40 of the June 5 issue and entitled "Making the Ford Fleet-footed."—George F. Miller, Overland-Knoxville Co., Knoxville, Tenn.

1—Just applying the sixteen-valve-head to a Ford engine will not increase the speed of the car very much, but the power of the engine will be materially increased.

2—There is not very much theory to this sixteen-valve-head. It makes use of the valve-in-head principle, which admittedly is better for power than other forms of valve arrangement. Of course, the characteristic noise of the overhead rocker arm is present with this form of construction.

3—If speed is the essential requirement, then we advise that you try some racing-type carbureter.

4—Any good magneto or battery system will suffice for ignition purposes.

5-6-7—Look over the Ford rebuilding story in the July 3 issue. This is one of the most complete rebuilt jobs. Because of its completeness it costs the owner over \$2,500. The method of dropping the frame was illustrated.

8—The rebuilt car referred obtains about 30 m.p.g. of gasoline.

9—The Craig-Hunt head, with its chain-driven camshaft should not give any trouble if the chain is kept in adjustment and properly lubricated.

10—If the gear ratio is changed to 2.75 to 1, it is possible to make about 85 m.p.h. with the car.

Raceabout Body on Saxon

Q—Publish sketch of neat body of raceabout for a 1915 four-cylinder Saxon roadster.

2—Would it be practical to put Ford differential on this machine?

3—If this was done and the gear ratio changed to $2\frac{3}{4}$ to 1, what speed should be attained?

Could a Chalmers 30 transmission be fitted in this machine, and would this be of any advantage?—E. A. Stewart, Los Angeles, Cal.

1—This is shown in Fig. 18.

2—It would be rather difficult to install unless the whole rear axle system were used.

3—With a gear ratio of $2\frac{3}{4}$ to 1 the car should make over 65 m.p.h., whether the engine and frame will hold together under the strain is a question.

4—This change is not advised.

Chalmers 26 Speedster

Q—Publish suggestion for changing a 1914 Chalmers 26 from a five-passenger touring car to a speedster. I desire to use the same fenders, put a 30-gallon tank in the rear, and install vacuum feed for the gasoline. From whom could I secure a body?—C. E. Hall, Auto Sales Co., West Point, Miss.

This is shown in Fig. 19. See advertising columns of MOTOR AGE for body maker.

Sport Body on Ford

Q—In mounting a sport body on a 1915 Ford chassis I wish to have a shell built over the regular Ford radiator, shell to be shaped somewhat like a Rolls-Royce. Is this practicable? I would like to have the body shaped somewhat like a Murray roadster, seating two passengers, with a disappearing seat in the rear deck, gasoline tank in rear back of rear axle to cover unsightly Ford axle. Disk wheels of conical type.—F. J. Murphy, Pittsburgh, Pa.

The Ford chassis does not readily lend itself to as complete a change as this. The design in Fig. 20 corresponds with requirements as far as permissible.

Speeding Up Buick 24

Q—This 1913 Buick, model M24, roadster, gear ratio 4 to 1, will do 40 to 50 m. p. h. If this car is stripped, what gear ratio will we use to run 60 to 65 m. p. h. and where can we get the gears?

2—The camshaft is made so that about $\frac{3}{32}$ in. can be taken off the back of the cams. Would this increase the speed of the engine?

3—In the high-tension magneto we have drilled twenty-eight $\frac{1}{16}$ -in. holes in the skirt of the pistons. Could you suggest any way we could increase the speed of the engine?—E. C. Penrose, Penrose Garage, Newark, Ohio.

1—The ratio must be changed from 4 to 2.7 to 1. This will increase the speed from 45 m.p.h. to 65 m.p.h.

2—If this $\frac{3}{32}$ in. is ground off the heel of the cams, the engine's power will be increased materially, but the tendency of

the tappets toward noisy operation will be increased.

3—We do not happen to have the pitch of the timing gears on your car, but if the pitch is 10 or greater, then it will be well to advance the timing gears one tooth beyond the marked position. Gears with a coarser pitch than 10 advance the spark and the other timing a slight bit too much for fast operation. Other than this, and the changes you have mentioned, there is no way or scheme by which the engine will run much faster.

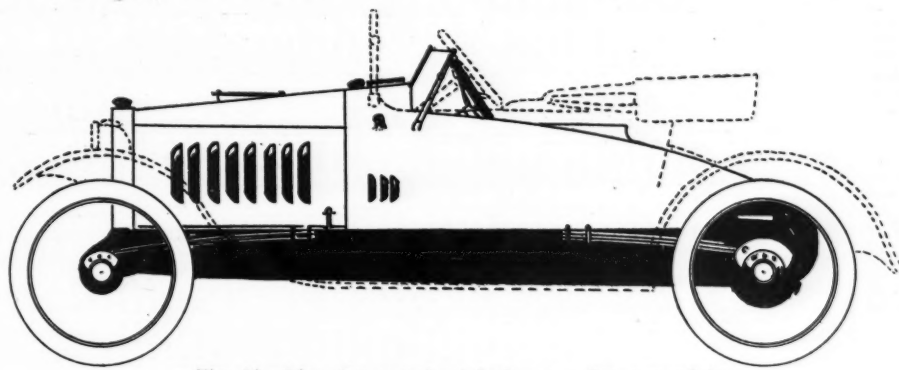


Fig. 18—Idea for raceabout body on a Saxon roadster

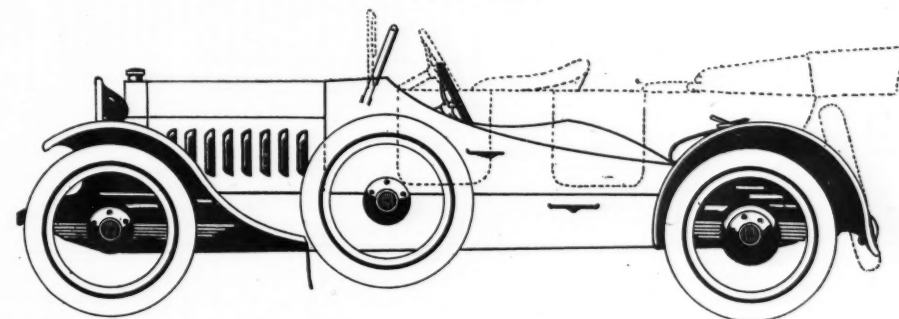


Fig. 19—A Chalmers 26 changed from touring car to speedster

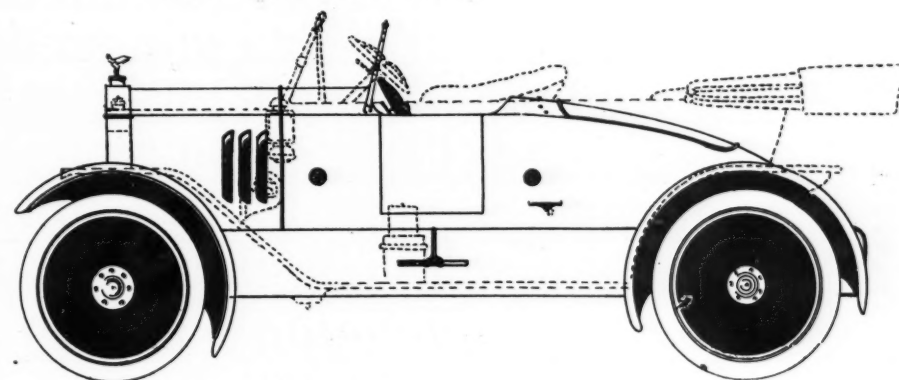


Fig. 20—Rolls-Royce lines for a 1915 Ford car

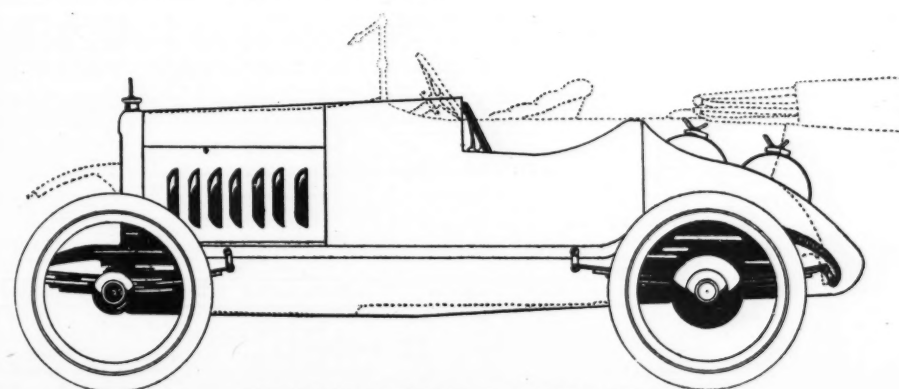


Fig. 21—Suggestion for snappy Maxwell racer

Motor Age Monthly Guide to Truck Specifications

Name and Model	Tons Capacity	Chassis Price	Front Tires	Rear Tires	Name of Engine	No. Cyl. Bore	Ignition	Electric Lighting	Governor	Carburetor	Clutch	Gears	Final Drive	Axle	Steering Gear
A. & B., 3T.	48x33 1/2	30x5	48x33 1/2	30x5	Ovn	4-3 1/2	Bosch	none	none	Schieb.	none	own	in-g.	Ovn	Gem.
A. & B., 5T.	48x33 1/2	30x5	48x33 1/2	30x5	Ovn	4-3 1/2	Bosch	none	none	Schieb.	none	own	in-g.	Ovn	Gem.
Acason, H.	30x5	30x5	30x5	30x5	Wauk.	4-3 1/2	Eise.	Nite.	Wauk.	Schieb.	Muncie	own	worm	Timkn.	Ross
Acason, L.	30x5	30x5	30x5	30x5	Wauk.	4-3 1/2	Eise.	Nite.	Wauk.	Schieb.	Muncie	own	worm	Timkn.	Ross
Acason, M.	30x5	30x5	30x5	30x5	Wauk.	4-3 1/2	Eise.	Nite.	Wauk.	Schieb.	Muncie	own	worm	Timkn.	Ross
Acason, R.	30x5	30x5	30x5	30x5	Wauk.	4-3 1/2	Eise.	Nite.	Wauk.	Schieb.	Muncie	own	worm	Timkn.	Ross
Acason, Tractor	30x5	30x5	30x5	30x5	Wauk.	4-3 1/2	Eise.	Nite.	Wauk.	Schieb.	Muncie	own	worm	Timkn.	Ross
Acme, B.	31,050 34x3 1/2	36x7	31,050 34x3 1/2	36x7	Wauk.	4-3 1/2	Eise.	G&D	Duplx.	Ray*	B.A.B.	own	chain	Ovn	Ross
Acme, C.	2,750 36x4	30x7	2,750 36x4	30x7	Cont.	4-3 1/2	Eise.	G&D	Duplx.	Ray*	B.A.B.	own	chain	Ovn	Ross
Acme, E.	4,850 36x4	40x6	4,850 36x4	40x6	Cont.	4-3 1/2	Eise.	G&D	Duplx.	Ray*	B.A.B.	own	chain	Ovn	Ross
Acme, F.	1,295 36x4	32x4	1,295 36x4	32x4	H-S	4-3 1/2	Eise.	G&D	Duplx.	Ray*	B.A.B.	own	chain	Ovn	Ross
All American, A.A.	1,295 36x4	32x4	1,295 36x4	32x4	H-S	4-3 1/2	Eise.	G&D	Duplx.	Ray*	B.A.B.	own	chain	Ovn	Ross
American	30x5	30x5	30x5	30x5	Buda	4-3 1/2	Eise.	West.	Pierce	Schieb.	B.A.B.	own	worm	Timkn.	Ross
American	30x5	30x5	30x5	30x5	Buda	4-3 1/2	Eise.	West.	Pierce	Schieb.	B.A.B.	own	worm	Timkn.	Ross
Armleder, H.W.	30x5	30x5	30x5	30x5	Buda	4-3 1/2	Eise.	West.	Pierce	Schieb.	B.A.B.	own	worm	Timkn.	Ross
Atlas, 19.	1,135 32x4	32x4	1,135 32x4	32x4	Lyc.	4-3 1/2	Eise.	West.	Pierce	Schieb.	B.A.B.	own	worm	Timkn.	Ross
Atterbury, 7R.	2,575 36x4	36x7	2,575 36x4	36x7	Cont.	4-3 1/2	Eise.	West.	Pierce	Schieb.	B.A.B.	own	worm	Timkn.	Ross
Atterbury, 7C.	2,975 36x4	36x7	2,975 36x4	36x7	Cont.	4-3 1/2	Eise.	West.	Pierce	Schieb.	B.A.B.	own	worm	Timkn.	Ross
Atterbury, 7D.	3,875 36x5	40x6	3,875 36x5	40x6	Cont.	4-3 1/2	Eise.	West.	Pierce	Schieb.	B.A.B.	own	worm	Timkn.	Ross
Atterbury, 8E.	2,975 36x4	36x7	2,975 36x4	36x7	Cont.	4-3 1/2	Eise.	West.	Pierce	Schieb.	B.A.B.	own	worm	Timkn.	Ross
Autocar, XXI-F.	4,050 36x4	34x5	4,050 36x4	34x5	Ovn	2-4 1/2	Eise.	West.	Pierce	Schieb.	B.A.B.	own	worm	Timkn.	Ross
Autoline, 10.	2,100 34x10	36x7	2,100 34x10	36x7	Cont.	4-3 1/2	Eise.	West.	Pierce	Schieb.	B.A.B.	own	worm	Timkn.	Ross
Available, 2.	2,950 36x4	40x6	2,950 36x4	40x6	Cont.	4-3 1/2	Eise.	West.	Pierce	Schieb.	B.A.B.	own	worm	Timkn.	Ross
Available, 3.	4,900 36x6	40x6	4,900 36x6	40x6	Cont.	4-3 1/2	Eise.	West.	Pierce	Schieb.	B.A.B.	own	worm	Timkn.	Ross
Beck, A.	1,550 34x3	34x4	1,550 34x3	34x4	Cont.	4-3 1/2	Eise.	West.	Pierce	Schieb.	B.A.B.	own	worm	Timkn.	Ross
Beck, B.	2,550 36x3	36x5	2,550 36x3	36x5	Cont.	4-3 1/2	Eise.	West.	Pierce	Schieb.	B.A.B.	own	worm	Timkn.	Ross
Beck, C.	3,550 36x6	36x6	3,550 36x6	36x6	Wauk.	4-3 1/2	Eise.	West.	Pierce	Schieb.	B.A.B.	own	worm	Timkn.	Ross
Beck, D.	1,950 32x3	34x4	1,950 32x3	34x4	Cont.	4-3 1/2	Eise.	West.	Pierce	Schieb.	B.A.B.	own	worm	Timkn.	Ross
Besemer, G.	2,750 36x3	36x5	2,750 36x3	36x5	Cont.	4-3 1/2	Eise.	West.	Pierce	Schieb.	B.A.B.	own	worm	Timkn.	Ross
Besemer, L.	2,750 36x3	36x5	2,750 36x3	36x5	Cont.	4-3 1/2	Eise.	West.	Pierce	Schieb.	B.A.B.	own	worm	Timkn.	Ross
Bethlehem, D.	1,955 32x3	34x6	1,955 32x3	34x6	N.A.	4-3 1/2	Eise.	West.	Pierce	Schieb.	B.A.B.	own	worm	Timkn.	Ross
Bethlehem, E.	2,365 34x4	34x5	2,365 34x4	34x5	N.A.	4-3 1/2	Eise.	West.	Pierce	Schieb.	B.A.B.	own	worm	Timkn.	Ross
Bethlehem, F.	3,465 34x4	36x8	3,465 34x4	36x8	Cont.	4-3 1/2	Eise.	West.	Pierce	Schieb.	B.A.B.	own	worm	Timkn.	Ross
Bourne, X.M.	3,500 36x4	36x8	3,500 36x4	36x8	Cont.	4-3 1/2	Eise.	West.	Pierce	Schieb.	B.A.B.	own	worm	Timkn.	Ross
Brinton, F.	1,500 32x4	33x10	1,500 32x4	33x10	Wauk.	4-3 1/2	Eise.	West.	Pierce	Schieb.	B.A.B.	own	worm	Timkn.	Ross
Briscoe, F.	855 31x4	31x6	855 31x4	31x6	Cont.	4-3 1/2	Eise.	West.	Pierce	Schieb.	B.A.B.	own	worm	Timkn.	Ross
Briscoe, F-24.	335x4	34x4	335x4	34x4	Ovn	4-3 1/2	Eise.	West.	Pierce	Schieb.	B.A.B.	own	worm	Timkn.	Ross
Brockway, 12	2,450 36x3	36x5	2,450 36x3	36x5	Cont.	4-3 1/2	Eise.	West.	Pierce	Schieb.	B.A.B.	own	worm	Timkn.	Ross
Brockway, S.	4,850 36x6	40x6	4,850 36x6	40x6	Cont.	4-3 1/2	Eise.	West.	Pierce	Schieb.	B.A.B.	own	worm	Timkn.	Ross
Brockway, R.	3,750 36x5	36x6	3,750 36x5	36x6	Cont.	4-3 1/2	Eise.	West.	Pierce	Schieb.	B.A.B.	own	worm	Timkn.	Ross
Brockway, T.	4,850 36x6	40x6	4,850 36x6	40x6	Cont.	4-3 1/2	Eise.	West.	Pierce	Schieb.	B.A.B.	own	worm	Timkn.	Ross
Chase, A.	1,725 36x3 1/2	36x5	1,725 36x3 1/2	36x5	Wauk.	4-3 1/2	Eise.	West.	Pierce	Schieb.	B.A.B.	own	worm	Timkn.	Ross
Chase, B.	2,025 36x3 1/2	36x6	2,025 36x3 1/2	36x6	Buda	4-3 1/2	Eise.	West.	Pierce	Schieb.	B.A.B.	own	worm	Timkn.	Ross
Chase, C.	2,475 36x4	36x6	2,475 36x4	36x6	Buda	4-3 1/2	Eise.	West.	Pierce	Schieb.	B.A.B.	own	worm	Timkn.	Ross
Chase, X.	2,800 36x4	36x5	2,800 36x4	36x5	Buda	4-3 1/2	Eise.	West.	Pierce	Schieb.	B.A.B.	own	worm	Timkn.	Ross
Chase, O.	3,000 36x5	36x5	3,000 36x5	36x5	Cont.	4-3 1/2	Eise.	West.	Pierce	Schieb.	B.A.B.	own	worm	Timkn.	Ross
Chase, T.	31x4	32x4	31x4	32x4	Ovn	4-3 1/2	Eise.	West.	Pierce	Schieb.	B.A.B.	own	worm	Timkn.	Ross
Chesapeake, 45	36x3	36x4	36x3	36x4	Cont.	4-3 1/2	Eise.	West.	Pierce	Schieb.	B.A.B.	own	worm	Timkn.	Ross
Chesapeake, 65	36x4	36x4	36x4	36x4	Cont.	4-3 1/2	Eise.	West.	Pierce	Schieb.	B.A.B.	own	worm	Timkn.	Ross
Chesapeake, 120B	36x5	36x5	36x5	36x5	Cont.	4-3 1/2	Eise.	West.	Pierce	Schieb.	B.A.B.	own	worm	Timkn.	Ross
Collier, 16	36x5	36x5	36x5	36x5	Cont.	4-3 1/2	Eise.	West.	Pierce	Schieb.	B.A.B.	own	worm	Timkn.	Ross
Columbia, F.	2,350 34x3 1/2	34x4	2,350 34x3 1/2	34x4	Lyc.	4-3 1/2	Eise.	West.	Pierce	Schieb.	B.A.B.	own	worm	Timkn.	Ross
Columbia, E.	1,850 32x4	33x6	1,850 32x4	33x6	Cont.	4-3 1/2	Eise.	West.	Pierce	Schieb.	B.A.B.	own	worm	Timkn.	Ross

[illegible]

Abbreviations: Engⁿ, Waukesha; Cont., Continental; H-S, Herschell-Spillman; Lye., Lycoming; N-A, North American; Herc., Hercules; Mil., Milwaukee; Wis., Wisconsin; LeR., LeROI; GBS, Golden Bellnap & Swartz; Beav., Beaver. Ignition—Eise, Eisemann; A-K, Atwater Kent; Koko, Kokomo; Spli., Splitdorf; Conn., Connecticut; Lau., Laurence; Berl., Berlin; A-L, Auto-Lite. Electric Lighting—Nite, Niteco; G&D, Gray & Davis; Al-Ch, Allis-Chalmers; West, Westinghouse; L-N, Lece A-R, Detroit; N-E, North East; Wae, Wagner; Asterk, electric starting alone. Governor—A-W, Auto-Weiss; Dupl., Duplex; Con., Continental; Mon., Monarch; Simp., Simplex; McCan, McCanna; Rugles, Rugless; Scheb, Schelber; Strom, Strome; Fyng, Fyling; Anglen, Angle-Shaw; M&E, Merchant & Evans; Gas, Gaslett; Holl., Holley; Ens., Ensign; Mast, Master; John., Johnson; Stev., Stewart; Trill, Trilsson; Cart., Carthers; Clutch—B&B, Borg & Beck; B-P, B-P; Barmes, Barms; Del., Detroit; H-S, Herschell-Spillman; Det., Detroit; Mech., Mechanic; Cover, Saver; Savage Arms, W. O. Co., Warner Gear Co.; Frail Drive Inc., Frail Drive Inc.; Interna gear d-rd., double reduction s.b.v., spiral bevel extg., external gear. Axle—Timk, Timken; Torbn, Torbenston; Key-H, Keystone-Hindley; Shel., Sheldon; Chicago, Chicago. Steering Gear—Gem., Gemmer; Lavr., Lavine; Warn., Warner; Dittw., Dittweiler; Jact., Jack; Fost., Foster; Kolb, Wohlbach. Tires—Asterk, pneumatic.

Name and Model	Chassis Price	Front Tires	Rear Tires	No. Cyl. Bore	Ignition	Electric Lighting	Governor	Clutch	Gearset	Final Drive	Axle	Steering Gear	Name and Model		Tons Capacity	Chassis Price	Front Tires	Rear Tires	No. Cyl. Bore	Ignition	Electric Lighting	Governor	Clutch	Gearset	Final Drive	Axle	Steering Gear
													Make of Engine	Make of Engine													
Macar, U.	2,000 36x5	40x6d	4-5 1x5 1/2	Wia.	4-5 1x5 1/2	opt.*	Mon.	H-Shaw	Opt.	worm	Timkn.	Ross	Ross	Macar, U.	1 1/2	2,000 36x5	40x6d	4-5 1x5 1/2	Wia.	4-5 1x5 1/2	opt.*	Mon.	H-Shaw	Opt.	worm	Timkn.	Ross
Macar, AB.	2,400 36x4	36x3d	4-4 2 1/2	Ovn	Split.	opt.	Ovn	B-Lipe	opt.	chain	Timkn.	Gem.	Gem.	Macar, AB.	1	2,400 36x4	36x3d	4-4 2 1/2	Ovn	Split.	opt.	Ovn	B-Lipe	opt.	chain	Timkn.	Ross
Macar, AB.	2,500 36x4	36x3d	4-4 2 1/2	Ovn	Split.	opt.	Ovn	B-Lipe	opt.	chain	Timkn.	Gem.	Gem.	Macar, AB.	1 1/2	2,500 36x4	36x3d	4-4 2 1/2	Ovn	Split.	opt.	Ovn	B-Lipe	opt.	chain	Timkn.	Ross
Macar, AB.	2,500 36x4	36x3d	4-4 2 1/2	Ovn	Split.	opt.	Ovn	B-Lipe	opt.	chain	Timkn.	Gem.	Gem.	Macar, AB.	1 1/2	2,500 36x4	36x3d	4-4 2 1/2	Ovn	Split.	opt.	Ovn	B-Lipe	opt.	chain	Timkn.	Ross
Macar, AB.	3,000 36x4	36x4d	4-4 2 1/2	Ovn	Split.	opt.	Ovn	B-Lipe	opt.	chain	Timkn.	Gem.	Gem.	Macar, AB.	1 1/2	3,000 36x4	36x4d	4-4 2 1/2	Ovn	Split.	opt.	Ovn	B-Lipe	opt.	chain	Timkn.	Ross
Macar, AB.	3,000 36x4	36x4d	4-4 2 1/2	Ovn	Split.	opt.	Ovn	B-Lipe	opt.	chain	Timkn.	Gem.	Gem.	Macar, AB.	1 1/2	3,000 36x4	36x4d	4-4 2 1/2	Ovn	Split.	opt.	Ovn	B-Lipe	opt.	chain	Timkn.	Ross
Macar, AC.	4,000 36x5	40x6d	4-5 3 1/2	Ovn	Split.	opt.	Ovn	B-Lipe	opt.	chain	Timkn.	Gem.	Gem.	Macar, AC.	2 1/2	4,000 36x5	40x6d	4-5 3 1/2	Ovn	Split.	opt.	Ovn	B-Lipe	opt.	chain	Timkn.	Ross
Macar, AC.	5,250 36x6	40x6d	4-5 3 1/2	Ovn	Split.	opt.	Ovn	B-Lipe	opt.	chain	Timkn.	Gem.	Gem.	Macar, AC.	3 1/2	5,250 36x6	40x6d	4-5 3 1/2	Ovn	Split.	opt.	Ovn	B-Lipe	opt.	chain	Timkn.	Ross
Macar, AC.	6,250 36x7	40x7d	4-5 3 1/2	Ovn	Split.	opt.	Ovn	B-Lipe	opt.	chain	Timkn.	Gem.	Gem.	Macar, AC.	5 1/2	6,250 36x7	40x7d	4-5 3 1/2	Ovn	Split.	opt.	Ovn	B-Lipe	opt.	chain	Timkn.	Ross
Macar, AC.	6,250 36x7	40x7d	4-5 3 1/2	Ovn	Split.	opt.	Ovn	B-Lipe	opt.	chain	Timkn.	Gem.	Gem.	Macar, AC.	7 1/2	6,250 36x7	40x7d	4-5 3 1/2	Ovn	Split.	opt.	Ovn	B-Lipe	opt.	chain	Timkn.	Ross
Macar, AC.	6,500 36x7	40x7d	4-5 3 1/2	Ovn	Split.	opt.	Ovn	B-Lipe	opt.	chain	Timkn.	Gem.	Gem.	Macar, AC.	11	6,500 36x7	40x7d	4-5 3 1/2	Ovn	Split.	opt.	Ovn	B-Lipe	opt.	chain	Timkn.	Ross
Macar, AC.	6,500 36x7	40x7d	4-5 3 1/2	Ovn	Split.	opt.	Ovn	B-Lipe	opt.	chain	Timkn.	Gem.	Gem.	Macar, AC.	13	6,500 36x7	40x7d	4-5 3 1/2	Ovn	Split.	opt.	Ovn	B-Lipe	opt.	chain	Timkn.	Ross
Macar, AC.	6,500 36x7	40x7d	4-5 3 1/2	Ovn	Split.	opt.	Ovn	B-Lipe	opt.	chain	Timkn.	Gem.	Gem.	Macar, AC.	15	6,500 36x7	40x7d	4-5 3 1/2	Ovn	Split.	opt.	Ovn	B-Lipe	opt.	chain	Timkn.	Ross
Macar, AC.	6,500 36x7	40x7d	4-5 3 1/2	Ovn	Split.	opt.	Ovn	B-Lipe	opt.	chain	Timkn.	Gem.	Gem.	Macar, AC.	17	6,500 36x7	40x7d	4-5 3 1/2	Ovn	Split.	opt.	Ovn	B-Lipe	opt.	chain	Timkn.	Ross
Macar, AC.	6,500 36x7	40x7d	4-5 3 1/2	Ovn	Split.	opt.	Ovn	B-Lipe	opt.	chain	Timkn.	Gem.	Gem.	Macar, AC.	19	6,500 36x7	40x7d	4-5 3 1/2	Ovn	Split.	opt.	Ovn	B-Lipe	opt.	chain	Timkn.	Ross
Macar, AC.	6,500 36x7	40x7d	4-5 3 1/2	Ovn	Split.	opt.	Ovn	B-Lipe	opt.	chain	Timkn.	Gem.	Gem.	Macar, AC.	21	6,500 36x7	40x7d	4-5 3 1/2	Ovn	Split.	opt.	Ovn	B-Lipe	opt.	chain	Timkn.	Ross
Macar, AC.	6,500 36x7	40x7d	4-5 3 1/2	Ovn	Split.	opt.	Ovn	B-Lipe	opt.	chain	Timkn.	Gem.	Gem.	Macar, AC.													

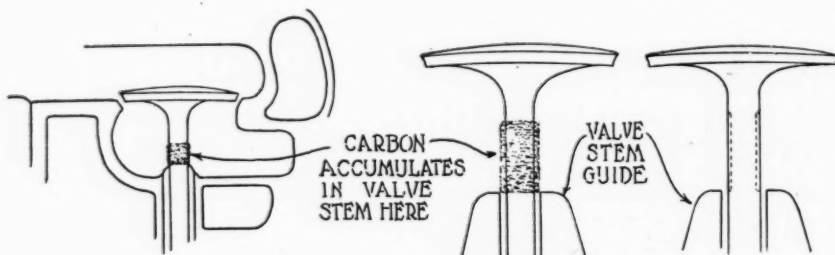
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Abbreviations: Engine—Wauk; Waukasha; Conty., Continental; H.S., Herschell-Spillman; Lye., Lyeomung; N.A., North American; Herc., Hercules; Mil., Milwaukee; Wis., Wisconsin; Le.R., LeRoi; CBS, Golden Bellkap & Swartz; Beav., Beaver. Ignition—Eise, Eisenmann; A-K, Atwater Kent; Koko, Kokomo; Spili., Splitdorf; Conn., Connecticut; Lau., Lauraine; A-L, Auto-Lite. Electric Lighting—Nlite, Nicollie; G&D, Gray & Davis; Amp., Amper; Al-Ch., Allis-Chalmers; Dynco, Dynamic; West., Westinghouse; L-N, Leece-Neville; Det., Detroit; N-E, North East; Wag., Wagner. Asterisk, engine starting also. Governor—Wauk, Waukasha; Duplx., Duplex; Cont., Continental; Mon., Monarch; Simp., Simplex; McCann, McCanna; Pugles, Pugliese; Carbureter—Schob., Schobel; Strom., Stromberg; Ray., Rayfield; King., Kingston; Mon., Monarch; Shake., Shakespear; Car., Carter; Flech., Fletcher; Holl., Holley; Engin., Engine; Mast., Master; John., Johnson; Stev., Stewart; Till., Tillotson; Asterisk, vacuum feed. Clutch—B&B, B&B; B-Line, Brown-Line; Day., Dayton; H-Shaw, Hele-Shaw; Mech., Mechanics; M&F, Merchant & Evans; Lye., Lyeomung; W. G. Co., Warner Gear Co. Gearsed, B-Lipe, Brown-Glee; G-Lee, Grant-Lee; Mec., Mechanics; Cover., Coverst; Savg., Savage; B-Lime, B-Line; Worm-Lipe, Day; Trefford, Trefford; Meel., Mechanicals; M&F, Merchant & Evans; Lye., Lyeomung; W. G. Co., Warner Gear Co. Final Drive—in e, internal gear; d-d, double driven; e-bev, spiral bevel; ext-g, external gear. W. G. Co., Warner Gear Co. Final Drive—in e, internal gear; d-d, double driven; e-bev, spiral bevel; ext-g, external gear. Aldw.—Tumkin, Torben; Torben-Torben; Key-H, Keystone-Hindley; Sbel., Sheldon; Salsby, Salisbury; Ind., Industrial; Chgo., Chicago. Standard, Chicago, Chicago. W-W, Walker-in-e; Emp., Empire. Steering Gear—Gem., Gemmer; Larve., Larve; Warn., Warner. Adm., Admetable; Tiv., Tiveltjer; Jack., Jacob; Foot., Foster; Wollab., Tine; Ascrub, pneumatic.

The Motor Car Repair Shop

Practical Maintenance Hints

Carbon Removal and Undercutting Valve Stem



The dotted line at right shows cutting away all around stem to care for accumulated carbon

CARBON is a bothersome thing and is responsible for many motor car engine ills and also for a share of the trouble that comes to the owner when on the road.

It has always been found that removal of this portion of fuel waste soon brings almost perfect functioning of an engine, with great increase in power—consequently a saving in fuel—and an all-round satisfaction in driving the machine.

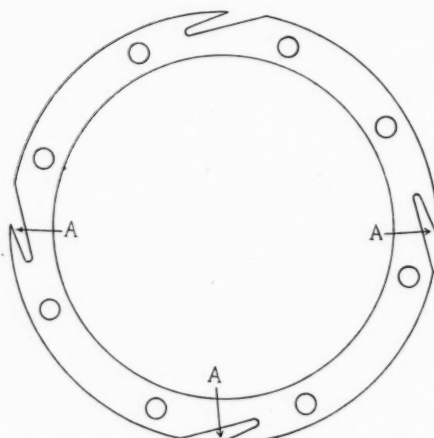
Valves that are covered with carbon will not seat as they should, and this means that a surplus of fuel must be fed to produce sufficient power for the engine to do the duty required of it.

Thus it is clear that it pays to keep the engine free from that annoying element. But this goes even further, for when the engine is not running smoothly it means the bearings of the connecting rods and crankshaft are being unnecessarily punished and pounded, resulting also in intermittent torque that cannot possibly be of benefit to gears, universal joints, differential parts and keys and keyways on shafts.

Not Only Carbon Spot

In the combustion chamber to cause pre-ignition and on the valves and their seats to prevent compression is not the only spot carbon delights to roost. It might be possible to have perfectly clean valves and seats and no carbon in the combustion chamber, and still trouble might come in the running of the engine; there is another spot where an accumulation of carbon will most effectively destroy compression.

On some engines carbon has a habit of accumulating on the valve stem immediately above the guide; it has happened on otherwise perfectly behaved engines. A case in point was where the engine seldom had been guilty of misfiring even under aggravating circumstances such as fouled collector ring on the magneto, carbon on the valves and seats and carbon in the combustion chamber.



Clutch disks used on Hupmobile 32

Attention to the ignition brought no remedy; it was evidently a case of a sticking valve, for at low engine speeds the misfiring did not develop and when the engine was cold there was little or no trouble. Likewise, the compression was not bad when the engine was turned over by hand; but when 30 m.p.h. was reached the trouble began and kept up. All this was pretty good evidence that at least one valve was not seating and perhaps two were offenders; it was also plain that the heat of the engine had expanded the valve stems and caused them to become tight enough to compel them to fail to pass in the guides readily.

Under the head of the valve and on that portion that worked up and down in the guide was found a heavy and hard coating of carbon, extending gradually downward to some extent, at least a sufficient quantity to prevent the valve from finding its seat as it should. The greater portion of the accumulation of carbon naturally would be immediately above the working part of the stem, but the carbon seemed to have a tendency to spread downward to whatever extent the size of the guide would permit. Some of it gradually piled up on the working

part of the stem, so that eventually the stem could not find its way home when working at high speeds.

This had not been the first offense of this particular engine and so a remedy was sought, with the result of undercutting the stem that portion of the stem which did not touch the guide, as shown herewith. This undercutting was to the extent of about 0.005 on an engine with a 3½-in. bore, but for a larger bore the undercutting should be more, up to 0.010, say, for an engine with 4½-in. bore.

By this means a space is provided for the accumulation of carbon, so that it would be impossible to cause trouble in this particular manner.

HUP MAINTENANCE HINT

Not infrequently the owner of a Hupmobile 32 finds occasion to ask a question about the difficulty of meshing the low-speed gear. Despite the fact that this model has not been made since 1914 there are many still in active service.

There are two causes for this difficulty, as has been discovered by search and experiment. In the earlier models of 1914 and those of 1913, which were counterparts of the 1914 except that they lacked the starting and lighting systems, no adequate provision was made for lubricating the bearing carrying the forward end of the transmission shaft, or, as it is known, the pilot bearing.

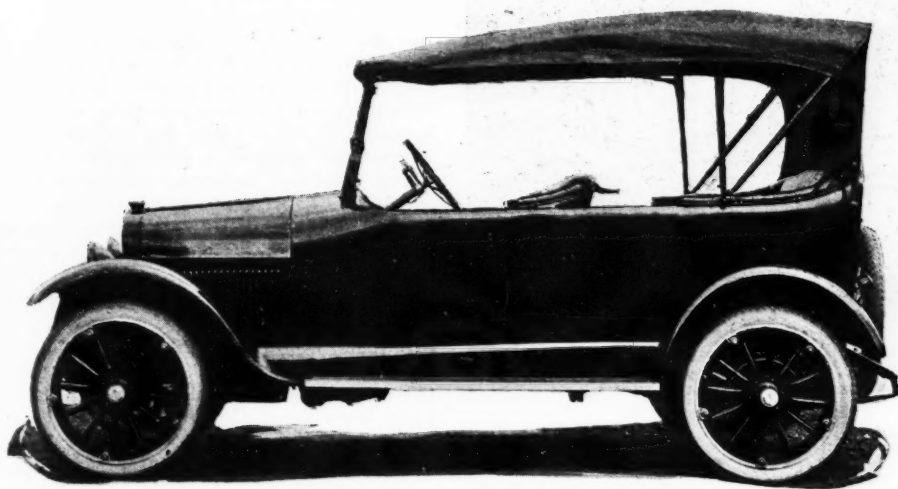
Without lubrication reaching this bearing, which is of the annular ball type, it is only natural that in time it would become sufficiently rusty to refuse to rotate, with the result that no matter how much the clutch pedal might be pressed the plates would rotate and prevent silent engagement of the low-speed gear.

In the later models of 1914 a groove was cut in the flywheel to permit oil finding its way to the bearing and thus the trouble was eliminated.

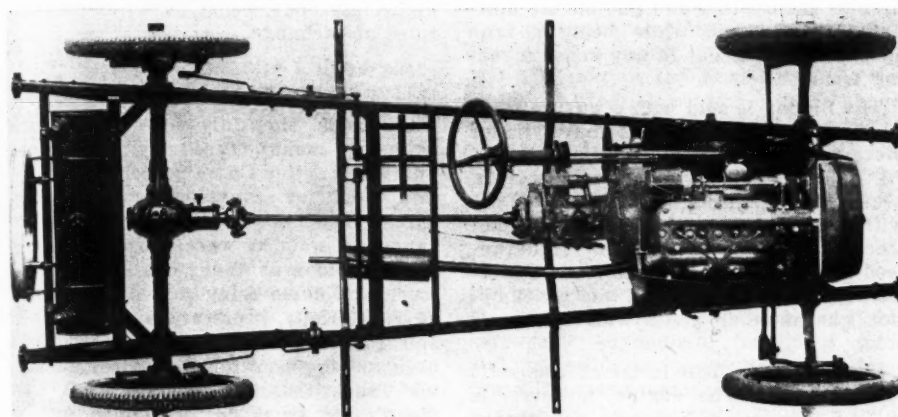
The clutch-driving disks used on this car were made as shown, being of saw steel. The little points shown at A were turned out slightly to act as spring releases, that is, to separate the plates and thus prevent them from dragging. It has happened that one or two of these points have been known to become broken off, with the result that the plate would be permitted to sag on one side, thus causing a bind and naturally a clicking noise when the clutch pedal was depressed. In addition this condition would not permit the plates to come together as well as they should and a slipping clutch would result, despite all the tightening on the clutch spring nuts. The remedy in this instance would be, of course, new plates.

Ease of Adjustment Is Feature of 1920 Maxwell

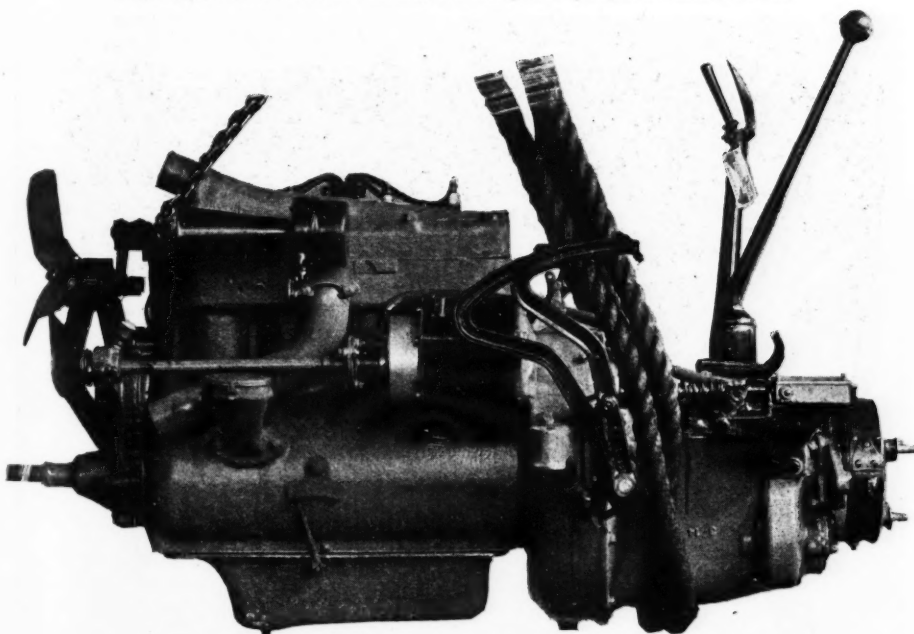
Many Refinements of Chassis and Body—
To Sell at \$985



Maxwell five-passenger touring car for 1920



Plan view of Maxwell chassis, showing the propeller shaft brake



Left side of engine for Maxwell, re-designed in many particulars

BYOND the mounting of the hand brake on the propeller shaft there is no great departure from previous practice in the 1920 Maxwell, although the car has been refined throughout and more than seventy changes have been made in the chassis and body. The hot spot and ram's horn manifold of Chalmers design have been incorporated, and improved design has reduced the weight of each piston 10 oz. Ease of adjustment throughout the chassis is noticeable, and different colors are used in the wire covering for the electric system, thus making maintenance simpler, as with the aid of the colored wiring diagram in the instruction book the wiring readily can be traced.

The body has been altered slightly so it gives the impression of being lower and longer. The wheelbase is the same, and no change has been made in the body except in the door locks, an improved non-rattling type. The radiator is larger and better looking. Capacity for about a quart more water is provided, and the radiator surface is larger. An improved metal name plate is used and with the new hood form the body generally has a better appearance.

The first of the chassis in production will carry five-passenger touring bodies. Other body styles will follow. The price has been increased \$90 and will be \$985, effective July 12.

Weight Is Increased

The changes and improvements in the car have increased its weight about 110 lb. The lighter reciprocating parts in the engine, due to the cutting off of 10 oz. a piston and the location of the spark plugs closer to the center of the combustion chamber and better manifolding, has so increased the torque that the acceleration and general roadability of the car is superior to that of former models.

Besides the changes in the engine already mentioned minor alterations include a four-blade fan mounted rigidly to the engine in place of the spring mounting. The ignition unit has been placed on the gearcase, making a more rigid assembly than the shelf construction formerly employed and eliminating oil leakage at this point.

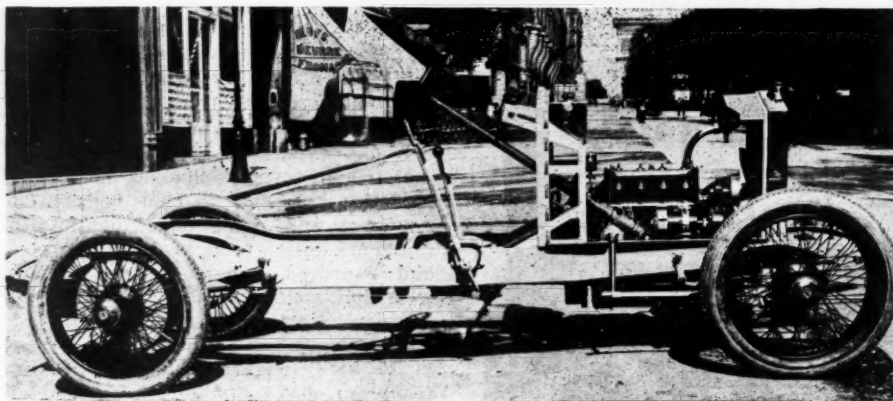
Some of the piston weight was cut off by the omission of the piston pin bushing, allowing the piston to carry the pin directly in the cast iron. Oversize pins are made by the factory for replacement, so in case of wear it is only necessary to re-ream the boss and insert an oversize pin.

The chassis changes in general tend toward greater strength or reduced effect of wear. As an example of the ease of adjustment, the drive pinion now is adjustable from the outside by a nut.

(Concluded on page 45)

French New Models Slow in Getting on Market

Bignan Car One of Earliest to Be Announced



Chassis of new Bignan sporting type car, a French model

NEW French cars are coming on the market very slowly. The reasons for this are manifold: Tool equipment has to be converted from war to peace requirements, raw material has to be obtained under most disadvantageous conditions and labor troubles have to be overcome.

In spite of this, the Bignan company has succeeded in getting out an entirely new model embodying features of interest and is making deliveries to the public. This car is a combination production involving Jacques Bignan, the designer and builder of the engine, and the Gregoire company, as builder and assembler of the chassis. In France it is known as the Bignan; in England and elsewhere it carries the name Gregoire.

The Bignan may be described as a sporting-type car on rational lines. France and England offer a market for a

medium-weight car of small cylindrical capacity, which will carry from two to five persons and which can be guaranteed to maintain a road speed of not less than 60 m.p.h. Hispano-Suiza was the first to realize this and put on the market a car which, while being a true sporting type, is not in any sense a racing freak.

The Bignan is sold with a guarantee of 63 m.p.h. The engine is a four-cylinder block-type of only 85 by 130 mm., 3.3 by 5.1 in. bore and stroke. Casting is L-head type. Chassis weight is 1930 lb., with a wheelbase of 112 in. and normal track. Gasoline consumption is guaranteed to be equal to 16 miles to the American gallon. A speed and gas consumption guarantee is given with every car sold.

Comparatively little in the chassis calls for comment. The engine, however, is full of interesting features. To secure the most compact powerplant, the de-

signers have eliminated the center bearing, and to avoid any possibility of whip in the crankcase they have avoided the use of aluminum castings. The four cylinders, each of 3.18 in. bore, measure only 16.92 in., overall length. Instead of following the growing practice of a detachable cylinder head, the Bignan engineers have adopted a detachable water-jacket head and have put the valve caps inside the waterjacket space.

Although a high efficiency type, no attempt has been made to get the maximum power out of the engine. It has been desired to secure a powerplant which, while guaranteeing 63 m.p.h. with full load, would be agreeable to handle at lower engine speeds. On this account the gas passages and valve diameters have been so designed that the power curve begins to drop from 2450 revolutions, at which speed 50 hp. is obtained.

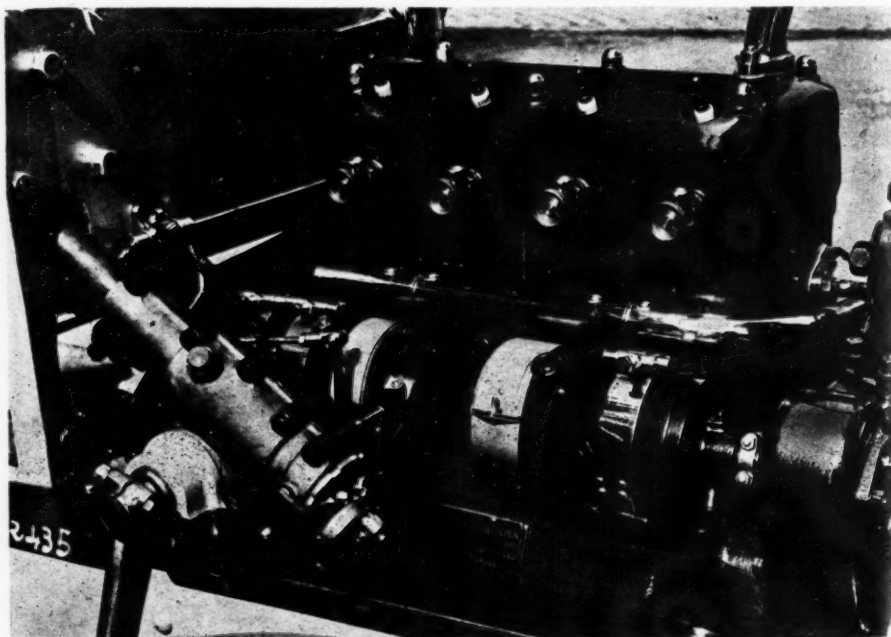
The Bignan is not an attempt to get into the cheap car class, the selling price of the four-seater touring model, with high class body, being \$8,950 at nominal rates of exchange.

KELDON 2-TON TRUCK

St. Louis, Mo., July 4—A 2-ton truck is being manufactured by the House Cold Tire Setter Co., a \$200,000 corporation which for seventeen years has been making machines for shrinking steel tire bands on wooden wheels without using heat. Keldon is the name of the new truck, the name being coined from those of T. K. Kelly, secretary and treasurer, and F. W. Gordon, designer, who has been an engineer for the Moreland Motor Truck Co., Los Angeles, Cal., and the Traffic truck in St. Louis. S. N. House is president.



Aluminum dash and polished instrument board



A 6-volt Westinghouse generator and motor are used on the French car

The first truck has been completed. Regular production will begin next month on a basis of fifteen to twenty-five cars a month. The truck has a wheelbase of 144 in., $4\frac{1}{4}$ by $5\frac{1}{2}$ Buda engine, Elsemann magneto, Stromberg carbureter, Fuller clutch and transmission, Russel internal gear axle, Ross steering gear, Firestone solid tires. It will sell at \$2,685, war tax additional, and \$100 for cab.

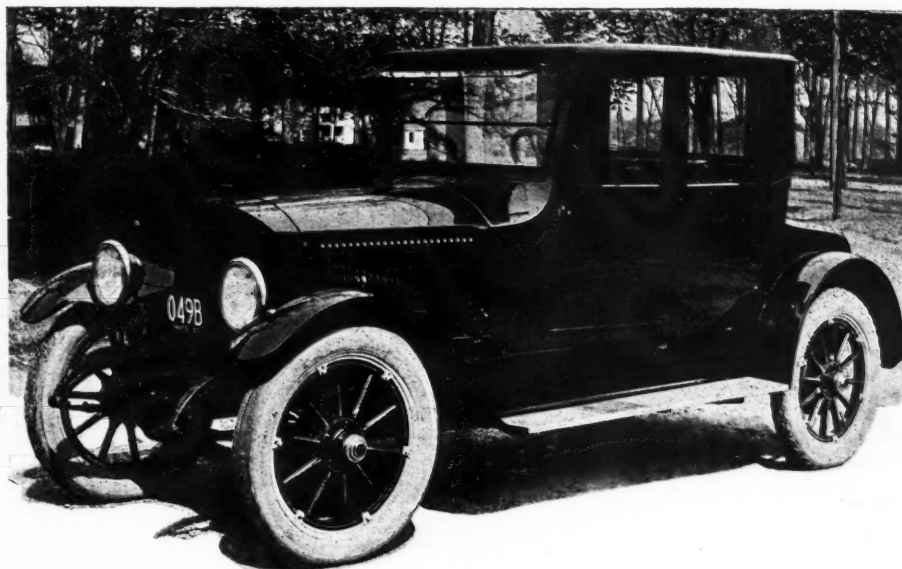
NEW MAXWELL FOR 1920

(Concluded from page 43)

Formerly it was necessary to take down part of the drive to make this adjustment.

The gearset has not been altered materially except where it has been necessary to do so on account of the installation of the contracting hand brake. This brake has a drum diameter of $7\frac{1}{4}$ in. and a face width of 2 in. As the reduction of the rear axle is $3\frac{5}{8}$ to 1, this brake drum is revolving at that relative speed as compared with the rear wheels. Thus considerable leverage is embodied and a highly efficient brake provided. Little pressure is required to lock the rear wheels, even when traveling at a fair rate of speed. The gear ratios are: Low, 17.04 to 1; intermediate, 7.30 to 1; direct, 3.58 to 1; reverse, 25.56 to 1. The gear-shift lever is longer and the drive is transmitted through Thermoid-Hardy universal joints in place of the metal type formerly used. These are three disk joints, made oversize to transmit the drive as well as absorb the braking torque.

The electrical units have been improved. The Simms generator still is employed, but instead of the six-brush type, the five-brush type with the odd brush for regulation is employed. The cut-out is mounted directly on the side of the generator, giving a very much more compact unit and the regulator formerly in the panel has been displaced by the brush regulator on the generator.



Stanley steam coupe with body made by the Currier Cameron Co.

The brush adjustment is on the outside, so a highly accessible adjustment for regulation is afforded. The Atwater-Kent closed circuit system is employed for ignition, and on the starting pinion is an overrunning clutch, which prevents danger of stripping the flywheel teeth. The horn button has been moved to the top of the steering column and the shape of the starting pedal changed to make it impossible to wedge the foot beneath the pedal, and furthermore, give a greater leverage and make the starting pedal easier to operate.

The instrument board is a unit and so designed that only the faces of the instrument show. It comprises a speedometer, ammeter, instrument board light, carbureter adjustment, individual push and pull switches for the lights and ignition. The instrument board light is independent of the head and taillight switches so that it is not necessary to drive with the instrument board lit.

The 12-volt system is still maintained,

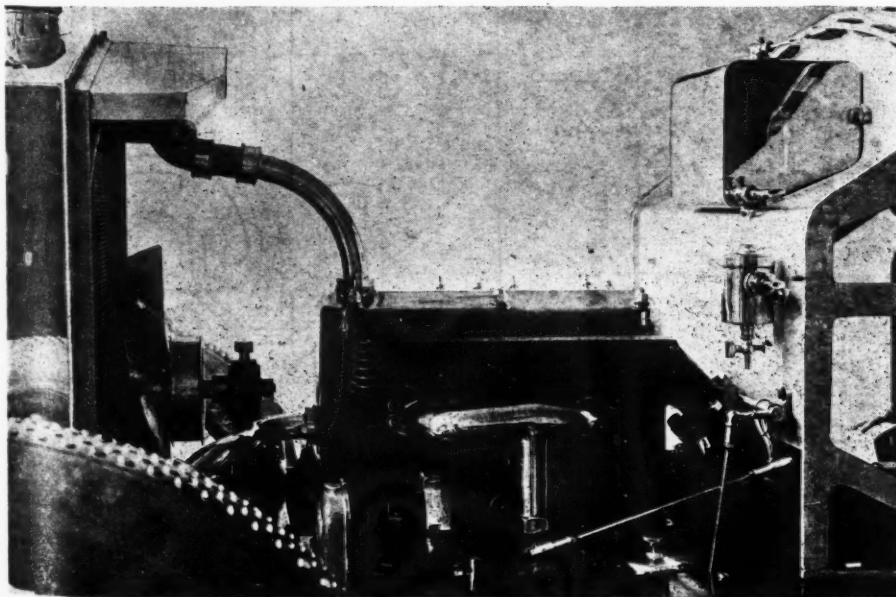
the headlamps being two-bulb, 12-volt, 4-cp. for dim, and 12-volt, 24-cp. for bright.

The front axle is now the conventional type with caster steering instead of the Le Moigne type formerly employed. To increase the wearing capacity of the axle, the steering knuckle spindle is larger, the steering knuckle bearings longer and rigidly fastened to the instrument board to eliminate vibration. The result of this improvement is easier steering and the new mounting provides greater accessibility, as it is possible by turning a nut on top of the steering gear housing to regulate the axial adjustment of the steering worm wheel, and by a readily accessible eccentric adjustment just beneath the housing it is possible to quickly adjust the mesh between the worm and the worm wheel.

The rear axle is also of improved construction throughout. In place of the three-pinion differential, a four-pinion differential now is used. The bearings are of larger size, the axle tube is larger, the wheel bearings heavier and the thrust washers also increased. In place of the rear spring being flexibly mounted so it was free to turn about the rear axle housing and lubricated by a grease cup, this construction has been replaced by the conservative type of mounting in which there is no relative movement between the spring shackles and the axle tubes.

MORE CAPITAL FOR KELLYS

New York, July 4—The Kelly-Springfield Tire Co. is issuing \$5,800,000 of 8 per cent preferred cumulative stock, to finance erection of a new plant at Cumberland, Md. With completion of the first unit of the Cumberland plant the company's production will be materially increased over the combined output of the Akron and Wooster, Ohio, and Buffalo, N. Y., factories. The Cumberland plant will have many new labor-saving features.



The carbureter side of the engine on the French Bignan car

Motor Age Wiring Diagram Chart No. 36

Abbott—March 20-27
Alco—April 24
Alter—Nov. 4
Apperson—March 6
Buck—Nov. 21-April 3
Cadillac—Dec. 9
Cartier—May 1
Case—Jan. 23-April 3
Coe—Feb. 27
Chalmers—Feb. 20
Chandler—April 3

Chevrolet—Nov. 28-Mar. 27
Crow-Elkhart—June 26
Davis—May 8
Detroit—March 6
Dodge—Dec. 12
Dort—March 13
Elgin—Feb. 27
Empire—March 13
Ford—Jan. 30
Franklin—June 19
Grant—Feb. 27-March 27

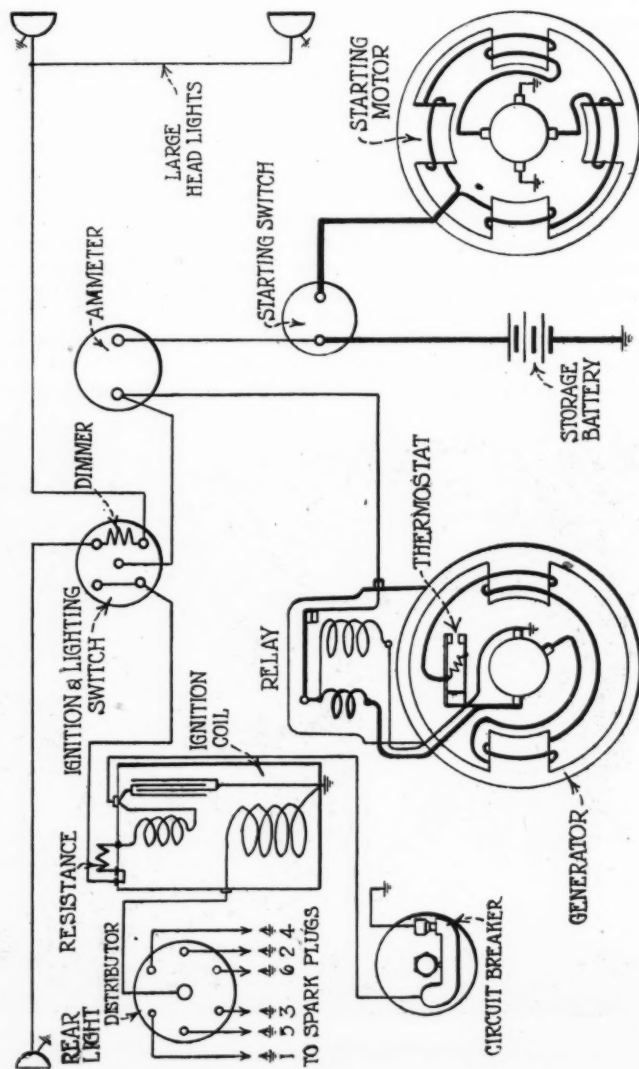
Henderson—April 3
Hudson—Dec. 5-May 1
Hupmobile—Feb. 13
Interstate—March 13
Kling—July 3
Kissel—July 6
Krieger—Feb. 6
Lexington—April 24
Little—March 20
Locomobile—Jan. 23-April 17
Maxwell—Jan. 16

Marion—March 6-20
Mercedes—Jan. 23
Michigan—March 20
Mitchell—Jan. 9
Murray—May 1
National—June 19
Oakland—Jan. 2
Oldsmobile—Jan. 23
Overland—Nov. 7-14
Packard—June 19
Paige—July 3
Paterson—June 26

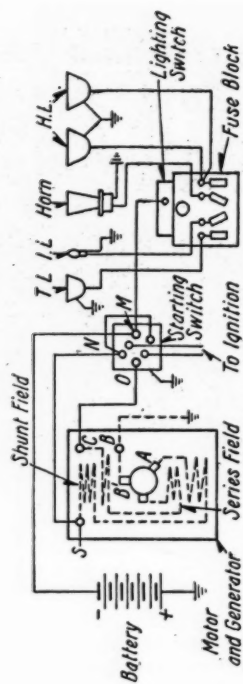
Premier—April 10
Pullman—April 10
Regal—Feb. 6-April 10
Reo—Feb. 27
Saxon—April 17
Scrapp-Booth—Dec. 26
Simplex—April 17
Stanley—June 26
Stearns-Knight—April 24
Studebaker—April 26
Velle—April 24
Westcott—May 8

Special System for Fords—May 15-22
General Battery Charging—May 29
General Magneto Diagrams—June 5

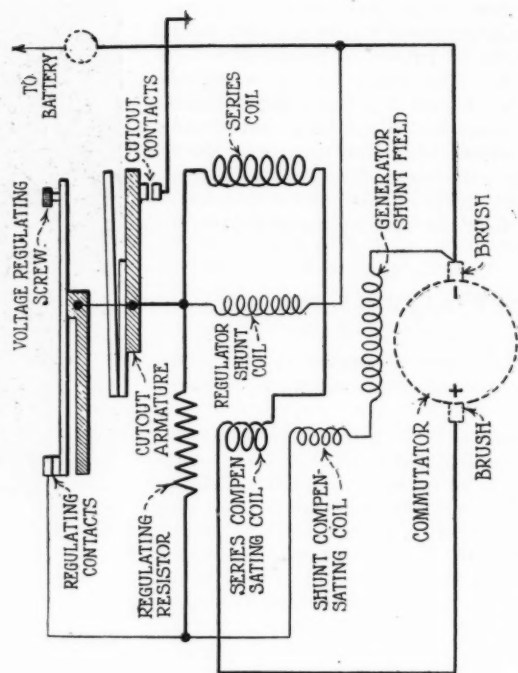
This Week—Internal Connections



General diagram illustrating all Remy installations of the third-brush system



Internal diagram of the combined Westinghouse unit, for all cars using this



Internal diagram of the externally controlled generator of the Westinghouse

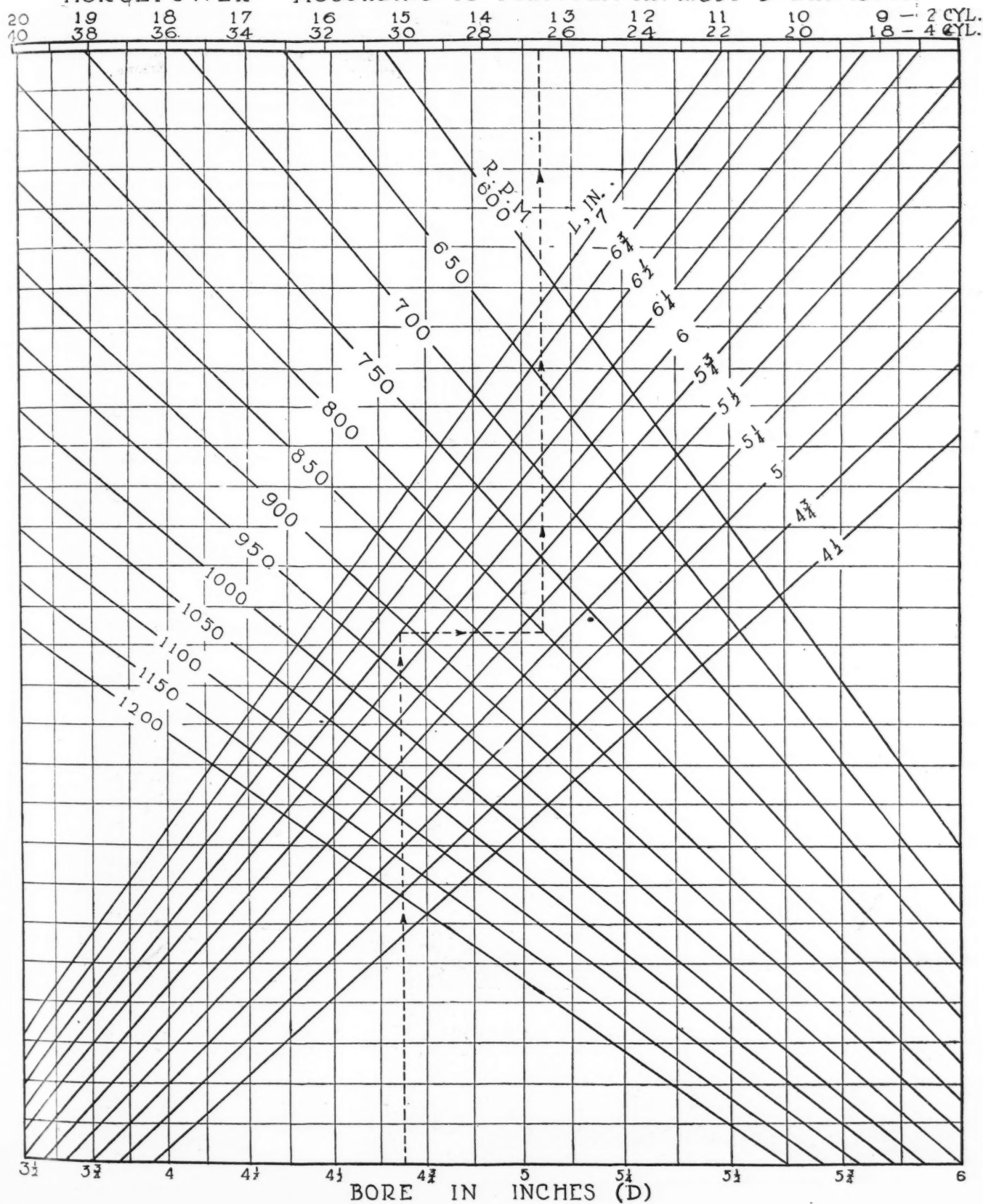
Tractor Rating Chart

(Based on formula recommended by Society of Automotive Engineers)

Motor Age Maintenance Data Sheet No. 44

One of a series of weekly pages of information valuable to service man and dealer—Save this page

HORSEPOWER ACCORDING TO FORMULA $HP = 0.7854 D^2 L R N \div 13000$.



Service Equipment

Time Savers of the Shop

Ring Remover Tool

THE Kerosene Motor Co., Peoria, Ill., is manufacturing a special tool for removing piston rings. This tool is like an inverted pair of pliers. Squeezing the handles spreads the ring apart. The jaws of the tool are equipped with special gripping forceps that grip any ring of plain or patented construction. The price of this tool is \$1.25.

Gates City Steam Generator

The steam generator made by Pechstein Iron Works, Keokuk, Iowa, develops steam very rapidly. It can be used for storage batteries, for special engine blocks, where the cylinder liners are removable and must be set with the aid of steam, and for tire vulcanizers not fitted with contained steam generators. These steam generators are furnished to burn electricity, water or gas. The fire box of the boiler is entirely surrounded by water surfaces, eliminating losses due to radiation, it is claimed.

Turner Engine Cleaner

The engine cleaner manufactured by the Turner Brass Works, Sycamore, Ill., is a tank that sprays the engine with gasoline or kerosene. The tank is equipped with a hand pump for regulating the pressure, and the hose for cleaning is long enough to reach any portion of the engine without moving the tank. The cleaner is made in three different sizes, ranging in capacity from 2 to 5 gal., selling from \$5.20 to \$26.40.

Hawkeye Cylinder Grinder

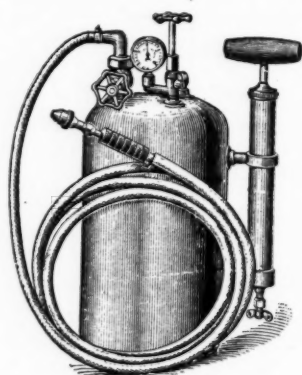
The Garage Tool Co., Council Bluffs, Iowa, makes a grinder attachment which can be applied to any engine. The spindle is one solid shaft running through a drawn steel tube with a double-row ball bearing at the pulley end and another

double-row ball bearing close to the grinding wheel. The housing and spindle are driven from the same countershaft, which rotates at 625 r. p. m., giving the spindle a speed of 5000 r. p. m. and the housing a speed of 30 r. p. m. The cutting range of this grinder varies from 2% to 7 in. in diameter and a 15-in. depth. The adjustment is fitted with a 2-in. micrometer capable of adjustment

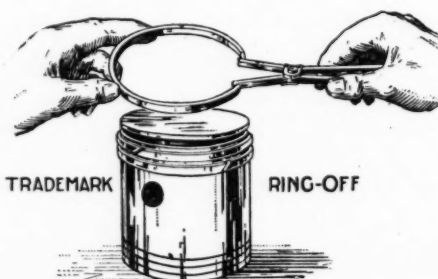
to .001 in. The angle plate which holds the cylinder blocks to the tool bed is capable of holding a four- or six-cylinder block to the frame.

Noonan Valve Refacing Tool

The Noonan valve-refacing tool fits all size valve stems without the aid of springs or special fitments. The valve is placed in this tool, the crank secured to the end of the valve stem and the cutting tool adjusted to trim the seat of the valve. A thumb screw gives a lateral adjustment on the valve after it is placed in position and the cutting tool is adjusted by moving it up and down. The device is made by D. R. Noonan, Paris, Ill.



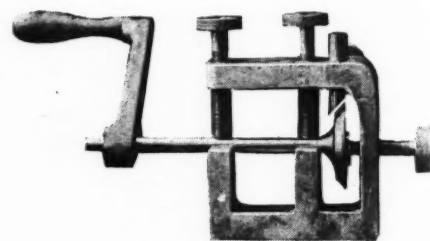
Turner engine cleaner



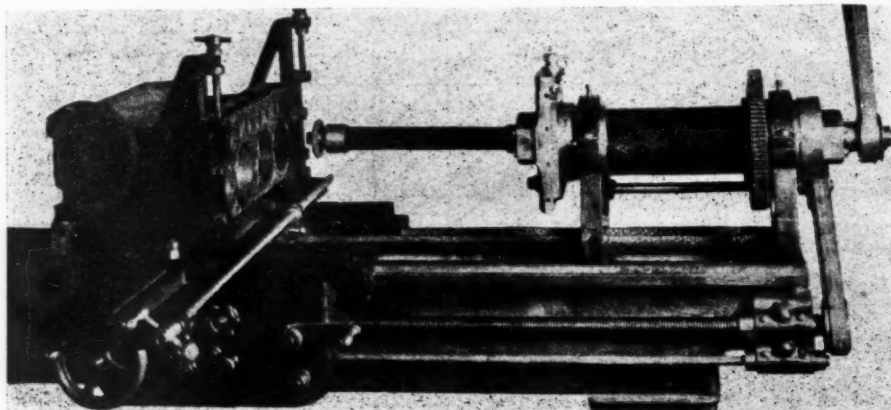
TRADEMARK RING-OFF



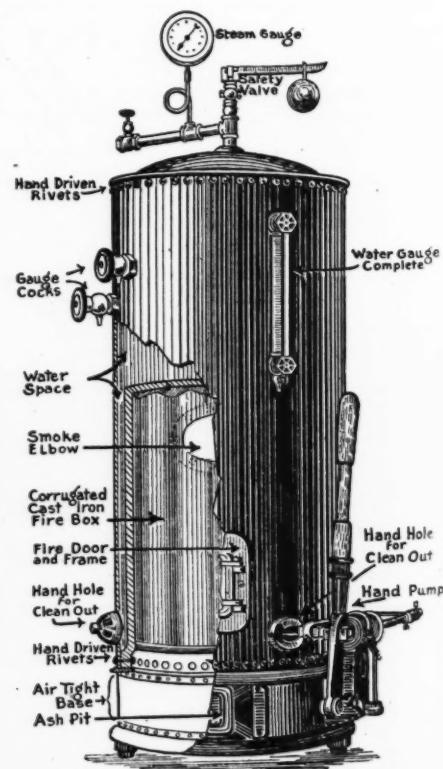
Tool for removing piston rings



Noonan valve-refacing tool



Hawkeye cylinder grinder attachment for universal application



Gates City steam generator

The Accessory Corner

New Fitments for the Car

Hart Lock for Fords

THE Hart lock for the Ford car manufactured by Hart & Co., of Appleton street, Boston, Mas., locks the control levers in the off position. The bar which fits over the spark lever of the car and then slides over the throttle through the slotted end is made of hardened steel to prevent its being filed or easily broken.

Mott Wire Wheels

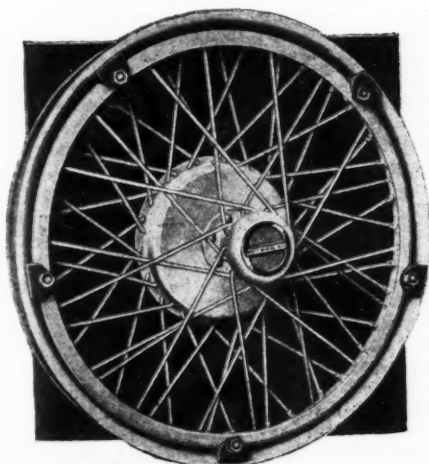
Wire wheels for Fords, using plain clincher tires and clinchers in the demountable form, are being made by the Mott Wheel Works, Jackson, Mich. These wheels have a large hub and present a very sturdy appearance. The spokes are of the crossed tangential type, a construction extremely strong. The bugbear of changing tires with the demountable rims is made easy with these wheels, it is claimed, for a spare can be replaced for an old tire in a few minutes.

Kobey Signal

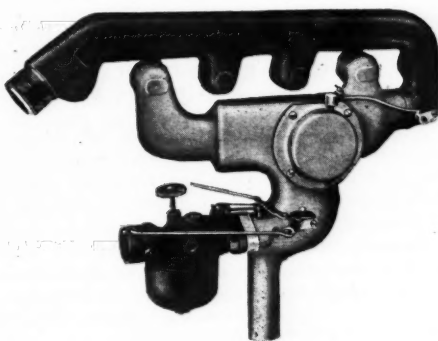
The signal made by the Chicago Die & Specialty Co., 327 South La Salle street, Chicago, furnishes information to the car



Hart lock for Ford steering wheel



Mott demountable wire wheel for Fords



B. K. F. manifold for Fords



Tungsten heavy-duty tractor plug



Signal made by Chicago company for rear of car

behind concerning your next move. The signal informs the car behind whether the next move will be a turn to the left or right or a stop. At night the targets are illuminated. The control of the signal is by small hand levers located on the steering wheel, which is operated without removing a hand from the wheel. Moving this lever to the right operates the right signal and moving it to the left operates the left target. Moving the hand downward brings the stop signal into view. When the lever is returning to neutral the signal drops back into its box, and the signal light and the lever light are extinguished. The lever light is to prevent the driver from forgetting to drop the signal. The targets are exposed to the weather only when they are in use, dropping back into the protective box when not in use.

B. K. F. Gas Producer

A new attachment for the Ford car that is being made by the B. K. F. Corp., 20 East Jackson boulevard, Chicago, is a new manifold for the Ford car. This manifold is unusual in that a thermostat automatically controls the temperature of the intake gases. This thermostat operates a butterfly valve at the forward end of the exhaust manifold, which admits the hot gases through the heated portion of the intake manifold and then omits the gases downward and out. The manifold is applied to the Ford without any changes. No special tools are needed to apply it except a wrench and a screwdriver, it is said.

Wolverine Shock Snubber

The Wolverine Parts Co., Hastings, Mich., is introducing a shock snubber for Ford cars. It is not necessary to replace the old shackles of the car to install these, for they fit directly over the old shackles and are fitted with a roller that grips the spring midway between the shackle and the clip, which tends to reduce the rebound action. Because the shock snubber fits over the old shackles the way it does the company claims side sway is eliminated.

Tungsten Tractor Plugs

The Tungsten Mfg. Co., Marshalltown, Iowa, manufacturer of the Tungsten plug, is introducing a new heavy-duty tractor plug. This plug is of the extension type fitted with a step chamber and a petticoat type core. The plug is so constructed that the insulating core becomes extremely hot and thus tends to burn off any oil which may be deposited on it. The shoulders of the core are protected with extra large copper asbestos gaskets.

Among the Makers and Dealers

Short Trade Notes

SCHNEIDER Now With Grant—Homer L. Schneider, for the last four years general manager of the Republic Motor Sales Co., Cleveland, Ohio, has joined the truck sales division of the Grant Motor Car Corp.

Peed Is Eastern Assistant Manager—L. G. Peed, who for the last six months has been acting as general sales manager of the New York Willys-Overland branch, has been appointed assistant manager of the eastern division.

Frazier With Goodrich Branch—Commissioner Forrest Frazier of the Tri-city Automobile Trades Association has resigned to accept a position with the B. F. Goodrich Rubber Co. branch at Davenport, Iowa.

Warren Is Nelson Chief Engineer—Cecil B. Warner, for the last five years with the Graham-Bernstein Motor Truck Co., Lima, Ohio, has been appointed chief engineer of the Nelson Motor Truck Co., Saginaw, Mich.

To Cover Territory from St. Louis—Reginald Reed, who will cover eastern Missouri, and J. A. Garrison, who will cover southern Illinois, have been added to the truck tire territory sales force of the St. Louis, Mo., branch of the Firestone Tire & Rubber Co.

Five Hundred Carloads of Motors—Five hundred carloads of light delivery trucks and cars, purchased of the Velle Motor Car Co. by the Government during the war, have been shipped to army camps. The bulk of the shipment has gone to Fort Benjamin Harrison, near Indianapolis, Ind.

O'Brien With Olds Truck—Thomas O'Brien is now in charge of the truck sales department of the Olds Motor Works, Lansing. He succeeds A. L. A. Spetler, who has gone to Minneapolis to become general manager of the Northwestern Oldsmobile Co., distributor in that territory. Mr. O'Brien is well known in truck sales circles in the East.

Columbus Branch for Timken—The Timken Roller Bearing Co., Canton, Ohio, will erect a factory in Columbus, where roller bearings and other parts will be manufactured. It is expected to rush the work of construction to have it completed within ninety days. The plant will cost between \$1,000,000 and \$1,500,000. The main building will be 500 by 300 ft. It is planned to employ between 500 and 700 men at the factory, which will be a branch.

Canadian Aerial Board Created—An aerial board has been created in Canada under an act passed during the present session, with Hon. A. L. Sifton, chairman, General Mewburn and Hon. C. C. Ballantyne, representing the militia and naval service departments respectively, as members; Lieut.-Col. C. M. Biegar, vice-chairman, and other members including: the deputy postmaster-general; assistant deputy minister of naval affairs and chief inspector of the department of customs and inland revenue. The board will frame regulations regarding civil flying. Present regulations in force were passed under the war measure act. The board will

supervise all matters connected with aeronautics; the control and management of aircraft necessary for the conduct of the public service; the fixing of routes of travel, etc.

King Leaves Pontiac Body—A. W. King, vice-president and plant superintendent of the Pontiac Body Co., has resigned. He will take a long vacation before making another connection.

Becker Now With Distributor—C. H. Becker, formerly assistant sales manager of the Chalmers Motor Co., has become associated with Joseph G. Blount, Chalmers distributor at Atlanta, Ga.

Fore Takes Fisk Service Station—William Fore, formerly service manager of the Fisk Rubber Co. has taken over the Fisk service station, Detroit, and will operate it under the name of the Super Tire Service Co.

Buick Had 3003 in Service—The Buick Motor Co. has given employment to 1400 returned soldiers and is re-employing them at a rate of nearly 300 a month, or fifteen a day. A total of 3003 employees were in service, of which nearly 40 per cent are back at their old positions.

Loew Now With New Era—O. W. Loew, for several years superintendent of the Globe Machine & Banding Co. and the Gabriel Mfg. Co., Cleveland, Ohio, and later with the Hayes Mfg. Co., Detroit, has been appointed production engineer of the New Era Spring & Specialty Co., Grand Rapids, Mich.

Reo to Run Detroit Branch—Due to a change in the policy of the Reo Motor Car Co., Lansing, Mich., which provides for a factory branch in Detroit, the agency contract of M. A. Young will terminate July 31. After that date Mr. Young will handle other lines. He already has acquired the agency for the Peerless.

Fisher Provides for Expansion—The Fisher Body Corp. has purchased 3¼ acres adjoining its Fort Street plant to provide space for future expansion. The price paid was \$18,000 an acre. While no definite plans have been announced, it is thought the company will start immediately on the enlargement of its plant.

Norton Opens Detroit Branch—The Norton Co., Worcester, Mass., manufacturer of Alundun and Crystolen grinding wheels and other abrasive products, has opened a branch office in Detroit. The store and service departments are to be managed by C. W. Jinnette, who has been the company's representative in Detroit for several years.

Zone Supervisors for Traffic—The Traffic Motor Truck Corp. has divided the United States into four sales zones, with a district supervisor for each as follows: F. S. Davis, R. H. Ferguson, R. Jackson Jones and R. Harbison. C. R. Hunter of St. Louis; C. A. Oppiger, former truck dealer of Pine Bluff, Ark.; B. P. Haynie, former truck salesman in South America, and H. D. Schlinck and K. O. Rieger of St. Louis have been added to the sales force. Harry P. Mammen, secretary and treasurer of the corporation, who has spent most of

his time in the West in organization work, has returned to St. Louis and will remain at the Traffic factory indefinitely.

To Recapitalize Four Drive—Plans are being considered to recapitalize the Four Drive Tractor Co., Big Rapids, Mich., for \$500,000. The present capital is \$200,000. A meeting has been called for July 11.

Rim Service Is Transferred—The Bearing Service Co., Detroit, will discontinue the handling of rim and rim parts for service purposes July 1. Arrangements have been made with the U. S. Motors Service Inc. to take over the rim service business.

To Sell King in Atlanta Territory—The King Motors Southern Co., Atlanta, Ga., has been organized to distribute the King in Georgia, Florida, Alabama and eastern Tennessee. Walter Hopkins, in the past connected with the Overland and Ford branches and the Cadillac agency in Atlanta, heads this new firm.

Japanese Plant for Goodrich—The B. F. Goodrich Co. is building a tire plant in Japan. It will be known as the Yokohama Rubber Co. The new plant is now nearing completion and will be ready for the machinery in a few weeks. William T. Huston, mechanical engineer for the Goodrich company, has applied for a passport to go to Yokohama, where the branch is being built.

Leitelt Iron Works Reorganized—The Leitelt Iron Works, Grand Rapids, Mich., has been reorganized with a capital of \$250,000 and is to incorporate. David C. McKay, identified with the company for four years, is president. The other officers include: Vice-president, F. J. Zylman; secretary and general manager, F. H. Meyer; treasurer, G. W. Sackett. Mr. Kelsey and his associates represent the new capital put into the business.

Atterbury to Double Capacity—Plans for practically doubling the plant and production of the Atterbury Motor Car Co. have been completed. The first of a series of new buildings planned by the company is to be completed within sixty days and is to be used as a service station. This building will be 180 by 80 ft., without posts or obstructions. Plans are now being completed for an assembly plant 100 by 450 ft. in the rear of the present plant in Buffalo, N. Y. Changes are to be made in the present factory buildings, which will enable the company to practically double its present production.

Garage Association Holds Outing—One hundred and forty members of the Philadelphia Garage Association and their friends enjoyed the organization's second annual sociability run, on Tuesday morning. There was a prize dash of thirty-four motor cars to the Mount Penn Hotel, the cars starting at 8 o'clock. The run was made in 3 hr. 38 min., by the winners, resulting in a triple tie, which probably will be settled later by the matching of a coin instead of another run for the prize. The tied winners are J. W. Nock, Warren Miller and George G. Blind, the latter being the association's president. Last year the run to Atlantic City, virtu-

ally the same distance, was made in 3 hr. 50 min. At Mount Penn the members indulged in outdoor sports, bowling, dancing and a banquet. They had the exclusive use for the day, of the hotel's attractions.

Lang Will Visit Scandinavia—J. Gustaf V. Lang, manager of the export department of the Master Trucks Inc., Chicago, will leave New York on July 8 for Scandinavia on business.

Oglesby With Eisemann Magneto—Richard A. Oglesby has recently become identified with the sales organization of the Eisemann Magneto Co. He was chief engineer of the Quick Action Ignition Co. until he entered Government service. He was president of the National Gas Engine Association for two terms, 1914-1916.

Maxwell-Chalmers Sales Buys Building—The Maxwell-Chalmers Sales Corp., Philadelphia, Pa., has purchased the five-story concrete building which for the last seven years has been occupied by the White Co. This structure was built by the Packard Motor Co. and then was bought by Windsor T. White of the White Co. The price of the present transaction is said to approximate \$500,000. Maxwell-Chalmers will occupy it in December, when White moves to its new building.

Midwest Opens Branch—Midwest Engine Co. has opened four branch offices. D. J. Carrison will represent the company in Jacksonville, Fla. Chester B. Loomis will manage the El Paso, Tex. office, covering western Texas, Arizona, New Mexico and southern California. Mr. Loomis had a consulting and mechanical engineering office in Los Angeles until he entered Government service. B. H. Downing is eastern sales manager with offices in New York, and J. R. Lowe is manager of the New Orleans office, handling the southern territory.

Jackson Spring Is Expanding—The Jackson Cushion Spring Co., Jackson, Mich., is preparing to double its plant capacity and production. Two plants of the Borden Condensed Milk Co. recently were purchased and are being converted into spring factories. Five hundred men are now at work, but this force will be increased to 1000. New machinery has been purchased and a part of it is being installed. The company is making springs for the Buick, Oldsmobile, Oakland, Dodge Brothers, Nash, Briscoe, White, Velle, Pierce-Arrow, Peerless, G. M. C. truck and Hupmobile.

Hart-Parr Makes Foreign Shipment—The Hart-Parr Co., Charles City, Iowa, sent out fifty-one tractors one day recently, shipment filling fifteen cars. Thirty of the tractors were crated and started for Angers, France. Nineteen were for distribution in the United States. There were also two large ship-steering engines for the Government. The Hart-Parr will have all the Government work off the floor by next month and can give all its time to the manufacture of tractors. Two tractors were sent to Brazil recently, and several have recently been sent to Porto Rico for use on sugar plantations.

Wilson Additions Progressing Rapidly—Work on the three additions to the Wilson Foundry & Machine Co., Pontiac, Mich., is progressing at top speed. It is expected the work will be completed in three months. Inability to get steel in big quantities has held up operations, but with all necessary steel now on the ground the contractors are rushing their work. The three buildings being erected are sand storage, or core room, foundry and

cupola buildings. The core room is 200 by 200 ft.; the foundry is 500 by 140 ft., and the cupola, 100 by 56 ft. All are of steel and concrete construction.

Parrett Moves Executive Offices—The Parrett Tractor Co. has moved its executive offices to the factory at Chicago Heights, Ill. Formerly all but the factory administration offices were in Chicago.

Transport in New Plant Aug. 15—The Transport Truck Co. will be in its new plant Aug. 15 and will start production, turning out ten trucks daily. The new factory is 300 by 160 ft., with a floor space of 48,000 sq. ft. A 20-ft. covered dock, 240 ft. long, is also being built.

Sterling Establishes Philadelphia Branch—The Philadelphia, Pa., agency for the Sterling truck has been changed to a direct factory branch under the management of H. O. Staehling, formerly service manager in the factory at Milwaukee, Wis. The Philadelphia territory includes Eastern Pennsylvania and New Jersey.

New Way Ready for Big Production—The New Way Motor Co., Lansing, Mich., since the signing of the armistice, has increased its production force 100 per cent. In some departments increase in business is necessitating night work. The production department is entirely adjusted to domestic lines again, and all is set for a rapid production increase.

Malbohm Getting Into Good Production—The Malbohm Motors Co., which recently moved to Sandusky, Ohio, from Racine, Wis., is getting into good production. The company is turning out forty complete cars weekly, the capacity of its present temporary quarters. The new plant, with 75,000 sq. ft. of floor space, will be ready July 31. It will have a production ca-

capacity of fifty cars a day. Operations in the new plant will start on a schedule of ten cars daily. This will be steadily increased.

O'Maley Organizes to Distribute Fordson—The G. T. O'Maley Tractor Co. has been organized at Kansas City, Mo., to distribute the Fordson. E. T. Howard is sales manager.

Moon Company Pays Dividends—The Moon Motor Car Co., St. Louis, Mo., has declared and July 1 paid its regular 1% quarterly dividend on the 7 per cent preferred stock.

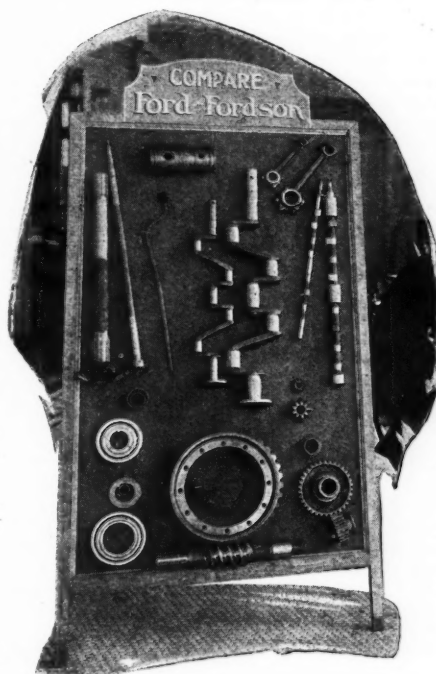
Guarantee on Stronghold Tires Higher—Stronghold fabric tires, which are made by the Rubber Products Co., Barberton, Ohio, now are guaranteed for 7500 miles on Ford sizes and 6000 miles on all other sizes.

Ahlberg Opens Third Branch—The Ahlberg Bearing Co., Chicago, which specializes in regrounding worn ball bearings and service on new high-grade bearings, has opened a new branch in Pittsburgh, Pa. This is the third branch opened by the company in the last two months.

F-W-D Divisional Supervisors—Three new divisional supervisors have been appointed by the Four Wheel Drive Auto Co., Clintonville, Wis., as follows: D. B. Cooper, formerly general sales manager of the Maxwell Sales Co. of Chicago, all territory west of the Mississippi river, with headquarters at Denver, Col.; Ed Feldhauser, formerly divisional sales manager for the Locomobile Co., Missouri, Oklahoma and eastern Texas, with headquarters in Kansas City, Mo., and H. C. Hall, formerly territorial distributor for the Cadillac from Milwaukee, Wis., Nebraska and Iowa, with headquarters at Omaha, Neb.

General Tire Builds New Pit—The General Tire & Rubber Co., Akron, Ohio, has built a daylight building which will be used for its vulcanizing department, or pit, as it is commonly called as it usually is underground where no air can circulate and the temperature is kept very high. The vertical vulcanizers, instead of being sunk in the ground, will extend from the first floor up through the ceiling, and their tops will be accessible from the second floor, where the men will work. The first floor will be used as a storage room. The building will be equipped with twenty-one vulcanizers, capable of curing 3000 tires daily. A traveling crane, electrically operated, will handle all molds and cores.

Chinese Flyer Buys Airplanes—Several De Haviland planes equipped with Liberty engines were purchased in Dayton, Ohio, by Ton Gon, former director of the Chinese air service, for the Chinese government, and arrangements have been completed for their early shipment to China. He also bought several Miller airplanes from the Miller Aeroplane and Supply Co., also of Dayton, for the Tool Kwong Aircraft Corp. of Canton and Shanghai, who intend to use them for commercial purposes. Mr. Gon, who is a licensed pilot under the Aeronautique Internationale and who has over 1000 actual flying hours to his credit, says aviation is yet in its infancy in China. Commercial schools teach flying for \$1,000 and provide rides for the curious at the rate of \$1.50 a minute. He is chief instructor of the Tool Kwong Aircraft Corp., a commercial aircraft firm in China, and intends buying several Thomas-Morse scout planes, several Vought training planes and three new Curtiss machines of the Oriole type. He will sail July 15 from San Francisco for China.



COMPARES CAR AND TRACTOR PARTS—Display of Ford car and Fordson tractor parts with which Dayton Keith, Fordson distributor for central Illinois, is furnishing his dealers. A charge of \$10 is made for the easel, but the parts are furnished free. The idea is to invite comparison between the corresponding parts of the car and tractor to emphasize the greater strength and durability of the tractor parts

From the Four Winds

Glimpses at the World of Motordom

CLUB Wants 2000 Members—The Delaware Automobile Association, has inaugurated a membership campaign with 2000 as the goal. It now has 700. It expects to accomplish the desired object by August 1.

New Club Has 100 Members—The Coshocton Automobile Club has been organized with an initial membership of almost 100. The membership covers the entire county. Clubrooms have been opened at the Park hotel, Coshocton, Ohio. Officers elected were: Udo Pamperin, president; H. B. Hunt, vice-president; C. R. Thrapp, secretary, and H. R. Speckman, treasurer.

Michigan Truck Routes Planned—Organization plans are on foot for the formation of the Grand Rapids Motor Transit Co., which is being financed by business men. It is proposed to capitalize it at \$150,000 for the establishment of truck routes between Grand Rapids, Kalamazoo, Grand Haven, Hastings, Cadillac and other cities. Four-hour service will be given, and eventually connection will be made at Jackson with Detroit truck service.

Grand Rapids Considers Landing Site—Grand Rapids, Mich., is investigating several proposed landing places in that vicinity in connection with its move to make Grand Rapids an aviation center. A site near Comstock park is under consideration and negotiations for options are under way. Costs are being estimated on making the landing place accommodate both airplanes and hydroplanes. Permanent hangars and visits by government airplanes are contemplated.

Two Dangerous Crossings Eliminated—Two of the most dangerous railroad crossings in the vicinity of Toledo, Ohio, have been eliminated by the construction of 1½ miles of new roadway along the New York Central and Toledo & Indiana lines, just west of the city. Within a distance of 1½ miles the Toledo-Wauseon road crosses three steam tracks and a single electric track twice. At both crossings the motorist had to drive over 246 ft. of railroad property. Innumerable accidents

have happened at these crossings. The New York Central safety-first department worked with the Maumee county road commissioners in eliminating this danger.

Thirty Trucks Supplant 4000 Camels—Thirty Wichita trucks, made by the Wichita Falls Motor Co., have been shipped to Central Asia, where the fleet will supplant a caravan of 4000 camels and 1000 drivers and caretakers, according to the Wichita company. The shipment was made in a special train to the Pacific coast. The purchaser is the Turkestan Agricultural Colonization Co., Kulja. Due to natural and political barriers, this company has to obtain its supplies and market its products at Tseutsin, China, 2000 miles from Kulja, a distance approximating that from Chicago to San Francisco. It requires more than a year for each caravan to make a round trip. The trucks will cover the distance in about thirty days. A camel is capable of handling about 300 lb. of pay load, while each truck with trailer, will carry 12,000 lb., or six tons. O. Bringewatt, Wichita Falls, Tex., accompanied the shipment and will remain with the Turkestan company for an indefinite period to instruct the Chinese drivers and supervise maintenance, repairs, etc.

Chauffeur Cannot Accept Discount—An act to make it unlawful for a chauffeur to accept discount or bonus payments from vendors of accessories or supplies has been passed by the Wisconsin legislature and is now in force. It reads "It shall be unlawful for any chauffeur, driver or other person having the care of a motor vehicle for the owner to receive or take directly or indirectly without the written consent of such owners any bonus, discount or other consideration for supplies or parts furnished or purchased for such motor vehicle or upon any work or labor done thereon by others or on the purchase of any motor vehicle for his employer and no person furnishing such supplies or parts, work or labor or selling any motor vehicle shall give or offer any such chauffeur or other person having the care or a

motor vehicle for the owner thereof, directly or indirectly without such owner's consent, any bonus, discount or other consideration thereon. Any person violating this section shall be guilty of a misdemeanor and punished by a fine not exceeding \$25."

Road Projects in Ohio—In all the Ohio highway commission has 161 road improvement projects in process of completion. Some of the projects are about completed while others have just been awarded. The projects are in practically every county in the state.

Wheat Tractor Forging On—Good progress is being made by the Wheat tractor, made by the Hession Tiller & Tractor Corp., in its transcontinental tour, the first attempted in a tractor. The tractor has reached Pittsburgh, having crossed the Alleghany mountains without incident. The tractor is making between 50 and 65 miles daily at an average speed of 10 m. p. h. Demonstrations are being made en route. From Pittsburgh the tractor was to go to Akron, Ohio.

To Deliver Parts by Plane—The first airplane agency in central Illinois, has been established at Galesburg by Lee Wright and Rollo Allensworth. They will handle the Curtiss and Canadian planes. The firm has been allowed the seven counties adjacent to their own for territory. It has been found that there is an urgent need for quick delivery of tractor, truck and implement parts during the busy seasons upon the farms, and the firm will cater to this trade. It is believed the extra cost will not be objectionable if the air service can save one or more days in harvesting. In addition to the air taxi service, covering any section of central Illinois, carrying persons or packages, the firm will give exhibition flights in connection with county fairs, political meetings and other outdoor celebrations and amusements of various kinds. Hangars will be erected and a landing field provided adjacent.

Milwaukee Works on Heavy Traffic—The Milwaukee police department, bureau of traffic, is experimenting with a new rule which prohibits motorists or other vehicle drivers from turning to the left at any intersection where traffic officers are on duty. The rule has aroused a storm of protest, it being considered as causing more inconvenience than promoting safety. However, the traffic bureau insists objections will disappear with more experience with the rule. Turns to the right may be made as heretofore. A driver desiring to reach a point on the left of the direction in which he is proceeding must either drive around the block or turn in the next block ahead, but not at the intersection. Ordinances have been framed to give the new rule more effect than at present, for it is now merely a police regulation. Downtown traffic in Milwaukee has increased enormously in the last year or two and it is agreed that radical changes must be made to prevent acute congestion already existing. Numerous other traffic regulations, new or used in other cities, will be tried out.

Coming Motor Events

TRACTOR DEMONSTRATIONS

Wichita, Kan.	Automotive Committee of National Implement Assn.	July 14
Aberdeen, S. D.	Sectional Tractor Demonstrations.	Aug. 18-22
Ottawa, Ont., Canada.	Inter-Provincial Plowing Match and Tractor Demonstrations.	October

RACES

Uniontown, Pa.	July 19
New York	July 26
Elgin, Ill.	Aug. 23
New York	Aug. 23
Uniontown, Pa.	Sept. 1
New York	Sept. 20
Cincinnati, Ohio	Oct. 1

SHOWS

Indianapolis, Ind.	Automobile Trade Association.	Sept. 1-6
Cincinnati, Ohio	Automobile Dealers' Association.	Sept. 13-20
Springfield, Mass.	Eastern States Exposition.	Sept. 15-20
New York	N. A. C. C.	Jan. 3-10
Chicago	N. A. C. C.	Jan. 24-31

The Hands and the Arms of the Driver

ROSS GEARS

*The Steering Gears
that
Predominate
on
Motor Trucks*

SINCE the steering gear is the only part of a motor truck in which human strength is concerned, which is constantly in use while the truck is in operation, it must follow that the efficiency of the truck depends very largely upon the hands and the arms of the driver.

However perfect the truck may be mechanically in other respects, if the steering gear is so hard to operate as to cause an excessive strain on the hands and arms that turn the steering wheel, it is impossible to secure real efficiency from either the man or the truck that he drives.

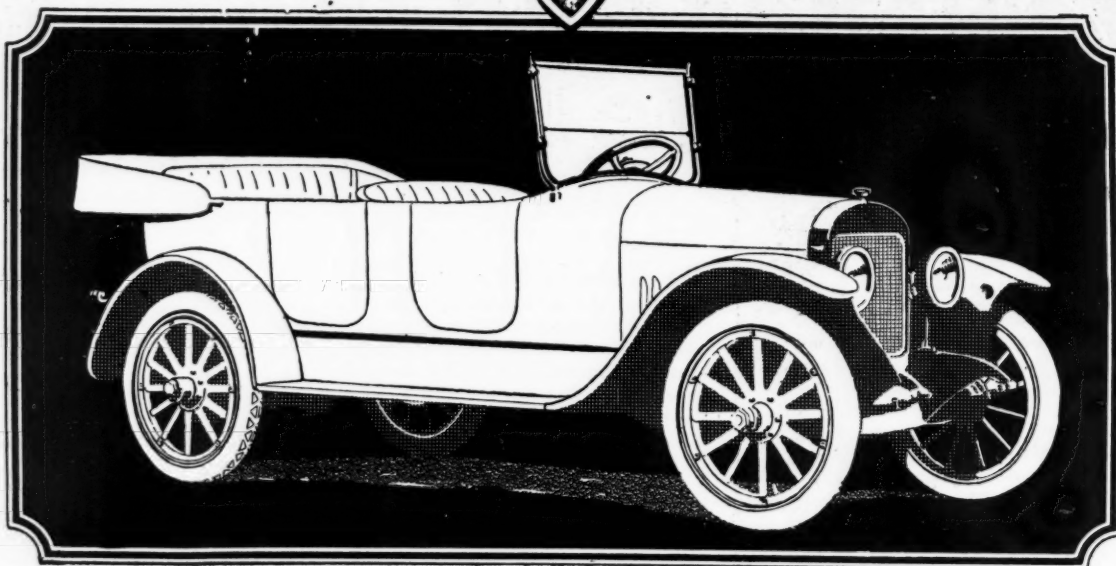
On the other hand, if the steering gear is *easy to operate* it conserves the strength of the driver and increases his efficiency. Easy steering means a bigger day's work more easily done, and driver and employer are both better satisfied.

The bearing surfaces in the screw and nut mechanism of Ross Steering Gears are so enormous that it is *easy to steer* the truck under all conditions. These bearing surfaces, together with the general design of the gear and Ross quality in materials and workmanship, guarantee also an unusual degree of safety and reliability.

Over 115 manufacturers, representing considerably more than half the entire motor truck industry, have recognized the superiority of Ross Gears by using them as standard equipment on their trucks. Their choice of Ross Gears is to a certain degree a guarantee of their complete product, as it is reasonable to suppose that each one has given the same careful attention to every detail in the construction of his truck.

*Write for catalog and any
special information
desired.*

ROSS GEAR & TOOL COMPANY, 400 Heath St., Lafayette, Ind.



Standard Units at a Wonder Price

Never before has such a combination of standard automobile units been offered at so low a price. The Crow-Elkhart embodies a unit-power plant, three-point suspension, Hotchkiss drive, semi-elliptic springs, full-floating rear axle, and frictionless universal joint construction. Both the sturdy light Six motor and the staunch long stroke Four deliver a superabundance of vibrationless energy, and at a surprisingly low gasoline consumption.

CROW-ELKHART Multi-Powered

Crow-Elkhart Six—5 Pass. Touring, \$1295; Six—2 Pass. Roadster, \$1295; Six—5 Pass. DeLuxe Tourster, \$1355; Six—4 Pass. DeLuxe Roadster \$1355; Crow-Elkhart Four—5 Pass. Touring, \$1145; Four—2 Pass. Roadster, \$1145; Four—5 Pass. DeLuxe Tourster, \$1205; Four—4 Pass. DeLuxe Roadster, \$1205; 1920 Six—5 Pass. Touring Car, \$1445.

WRITE FOR CATALOG CONTAINING FULL INFORMATION

CROW-ELKHART MOTOR CORPORATION, Dept. 101, ELKHART, INDIANA
Export Department, Broadway at 53rd St., New York City, U. S. A.

DEALERS will immediately recognize the new opportunity that the Crow-Elkhart Multi-Powered Line offers. Desirable territory is still open. Write today for particulars about our attractive dealer franchise.

MICHELIN

AN OPPORTUNITY

Notwithstanding the popularity of Michelin Tires, there are some towns where dealers can still secure this valuable account.

In these towns we offer the following:



1st—A thoroughly tested cord tire, made by the oldest pneumatic tire maker in the world.

2nd—A fabric tire of unsurpassed quality sold at a moderate price.

3rd—The only ring-shaped tube on the market—a tube that sells itself.

4th—One of the biggest and most impressive tire and tube advertising campaigns ever conducted.

5th—Special sales helps for individual dealers.

We invite you to write to us now.

MICHELIN TIRE COMPANY

Milltown, New Jersey



THERE can be no doubt that wire wheels are rapidly increasing the tremendous favor they have already won with American motorists.

To the motor car and accessory dealer, the significant and outstanding fact is that Hayes wire wheels attract owners of all types and makes of cars.

The reasons are very plain and easy to understand.

Hayes Wire Wheels, of course, are infinitely smarter. They add so greatly in beauty and distinction that an overwhelming preference for them was to be expected.

But this preference is not based on smartness

alone. Greater riding ease and superior convenience have added thousands to our lists of Hayes Wire Wheel users.

With a national advertising campaign that opens in July, we propose to make the Hayes preference still more pronounced and positive.

At the same time we are opening up an exceedingly attractive field for the dealer, by creating Hayes Wire Wheel business in every community.

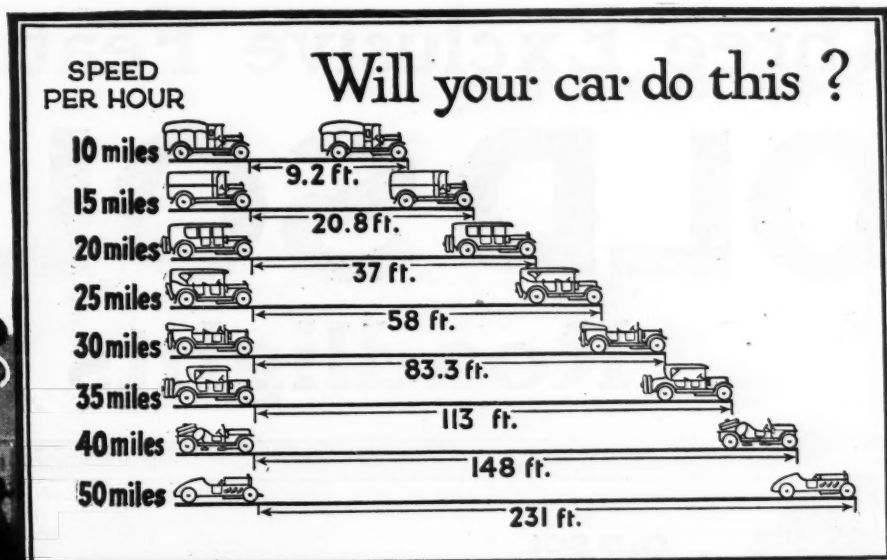
In case there is not now a Hayes Sales and Service Station in your locality, write us at once for details of the extraordinary opportunities in Hayes distribution.

Wire Wheel Division

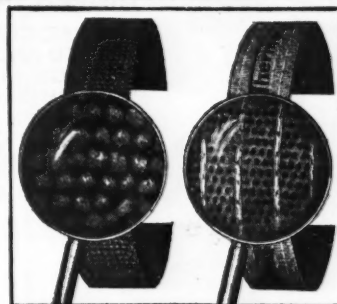
HAYES WHEEL COMPANY, JACKSON, MICHIGAN

World's Largest Builders of Wheels, Wire, Wood, Steel

When Writing to Advertisers, Please Mention Motor Age



This chart shows how quickly your car should stop at various speeds, if your brakes are in good condition and working right



Ordinary Woven Brake Lining
Notice the loosely woven texture.
Wears down quickly and unevenly.
Loses its gripping power as it wears.

Thermoid Hydraulic Compressed Brake Lining
Notice the compact texture. Wears down slowly. Gives uniform gripping surface until worn wafer thin.

Co-operating with 2000 Chiefs of Police

THE National Brake Inspection Movement is being supported by police officials throughout the country.

The Thermoid chart of stopping distances, now called the Police Traffic Regulation Chart, has been sent along with a personal letter to chiefs of police in all the towns of 2500 population and over, in this country. Newsy publicity articles, advocating brake inspection, are being given to local newspapers by the chiefs of police.

The chart of stopping distances is being placed in garages and conspicuous places.

It's only a question of a short time before there will be nation-wide legislation requiring safe, dependable brakes.

The dealer's big opportunity

This brake inspection movement, which has the hearty sympathy of police officials, motorists, presidents of automobile clubs and other prominent officials, means that car owners in every town in America will have their brakes inspected.

Many of these brakes will need relining.

The reputation of Thermoid and its national advertising campaigns will make it the choice of all motorists.

Every Thermoid dealer should enjoy phenomenal sales—you should get your share.

We are only too glad to give our dealers the heartiest co-operation in capitalizing this opportunity and building up a permanent, profitable volume of relining business. If you are not handling Thermoid, write today for information about the assistance which we give our dealers.

The famous Thermoid guarantee

Every foot of Thermoid Hydraulic Compressed Brake Lining is backed by our guarantee: **THERMOID WILL MAKE GOOD—OR WE WILL.**

Thermoid Rubber Company

Factory and Main Offices: Trenton, N. J.

New York, Chicago, San Francisco, Detroit, Los Angeles, Philadelphia, Pittsburgh, Boston, London, Paris, Turin.

Canadian Distributors

The Canadian Fairbanks-Morse Co., Limited, Montreal.
Branches in all principal Canadian cities.

Thermoid Brake Lining

Hydraulic Compressed

Makers of "Thermoid-Hardy Universal Joints" and "Thermoid Crolide Compound Tires"

When Writing to Advertisers, Please Mention Motor Age

Three Exclusive Features of OLDSOL Roadlights



**OLD SOL
UNIVERSAL BRACKET**
DOUBLE CLAMPS,
RIBBED AND SET SCREW
FITTINGS, FITS ALL
WINDSHIELDS AND
SUPPORTS, EITHER
STRAIGHT OR TAPERED
PATENTED

The "Old Sol" Universal Bracket is one of the attractive features that make the "Old Sol" Line such a good seller and satisfaction giver.

It fits all windshields, either straight or tapered, so that any "Old Sol" Roadlight—whether it be the Nitrojector ("King of All Roadlights"), the

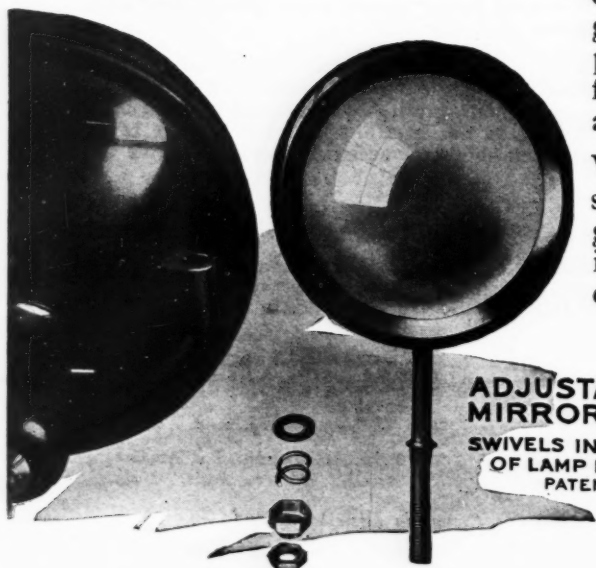
"Old Sol" model 70, or "Old Sol" model 77—fits your car as though it were made for it.

The "Old Sol" combination socket for the Bulb, the on-and-off Plunger Switch, and Focusing Device—all in one—make an "Old Sol" safer, easier to handle, and more comfortable.

Any bulb will fit the "Old Sol." The focusing device *makes* it fit.

The "Old Sol" Adjustable Mirrorscope is just another of those unusual features that give the "Old Sol" Roadlight its pre-eminence in the automobile field. You can tilt it to just the angle you desire.

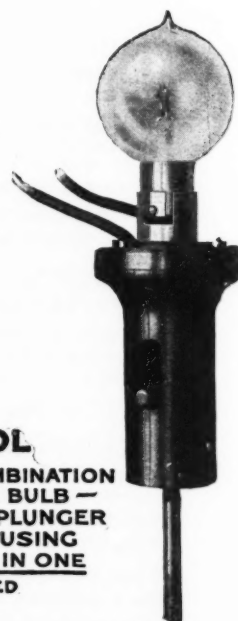
When you sell an "Old Sol" you can safely tell your customer that he is getting all that he can possibly obtain in roadlighting value, safety and comfort.



**ADJUSTABLE
MIRRORSCOPE**
SWIVELS INDEPENDENT
OF LAMP POSITION
PATENTED

*Write for
Our
Illustrated
Catalog.
Just Out!*

**OLD SOL
"LIBERTY" COMBINATION
SOCKET FOR BULB —
OFF-AND-ON PLUNGER
SWITCH — FOCUSING
DEVICE — ALL IN ONE
PATENTED**



THE HAWTHORNE COMPANY

BRIDGEPORT, CONNECTICUT, U. S. A.

TRADE MARK
Stan-Par
AXLES

Developing an
efficiency which
entirely changes
the common
view of what
constitutes good
axle performance

For Passenger Cars and Trucks

THE
STANDARD PARTS
COMPANY
AXLE DIVISION CLEVELAND, O.



Packard



Pierce-Arrow



Peerless



White



Buick



Studebaker



Kissel Car



Holmes-Knight



Auburn



Essex



Hudson



Chandler



Dodge



Oldsmobile



Hupmobile



Chalmers



Ford Government Ambulance



General Motors Government Ambulance



Standard Equipment

GABRIEL SNUBBERS

Make Your Car Ride Easier and Last Longer

READ THIS LIST

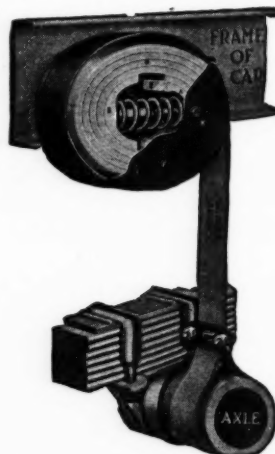
of cars that are standard-equipped at the factory with Gabriel Snubbers, or have holes in the frame for them.

What further proof is required that your car should be equipped with Gabriel Snubbers?

Let us send booklet and name of our nearest dealer.

GABRIEL MFG. CO.

1415 East 40th Street, CLEVELAND, OHIO



GABRIEL SNUBBERS keep the car from bouncing just as easily as the boy holds the bull—it's the COIL that does the trick.

When Writing to Advertisers, Please Mention Motor Age

\$1695



**A CAR OF
RARE BEAUTY**

The aristocrat of medium priced car

As cars go today the production of the Sayers Six has never reached a very high level. It is built on a quality rather than a quantity basis.

Look over the specifications and description of this car and you will see the truth of this statement. It is truly an unusual car at the price.

Many of the manufacturing methods are such as you would find only in custom made automobiles. For instance, there is the hand painting, the eight hour block test of the motor and the building of the

bodies by expert coach builders—seventy-five per cent of whom have been with us at least fifteen years.

The choice of mechanical parts conforms to the same high standards. They bear names you are familiar with and that the public knows and appreciates—Continental, Delco, Stewart and a host of others. To glance at the specifications of this car is to know the reason for its unusual success this season.

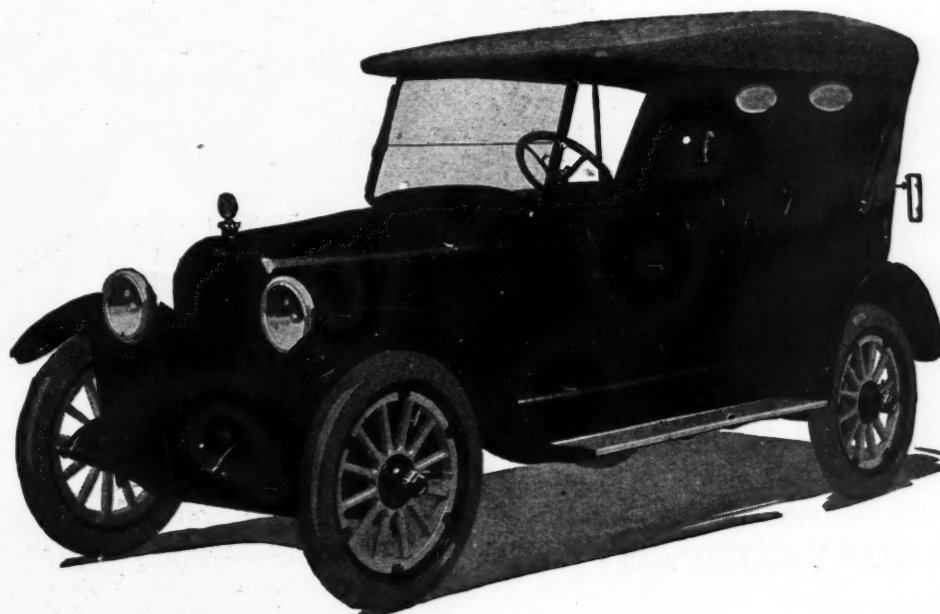
A request on your letterhead brings you a copy of our new catalog and full details.

THE SAYERS & SCOVILL COMPANY

Established 1877

Gest and Summer Streets

Cincinnati



HALLADAY

Direct Suspension Shock Absorber

Do You Know What Direct Suspension Means?

It means that the entire weight of the car is directly suspended on four sensitive springs of sufficient capacity to take the jolts, jars and vibration out of the roughest traveling.

It means that the load is carried on the ends and centers of the leaf spring and nowhere between these two points is there any strain that can bend or break the spring.

The Halladay Spring is of the famous "bee hive" type—the fastest and longest lived ever made.

The Halladay Direct Suspension Shock Absorber lowers depreciation, gas and tire expense, and makes it a joy to travel in your Ford car on any road.

Built and guaranteed by men who know.

Price per set.....\$15.00

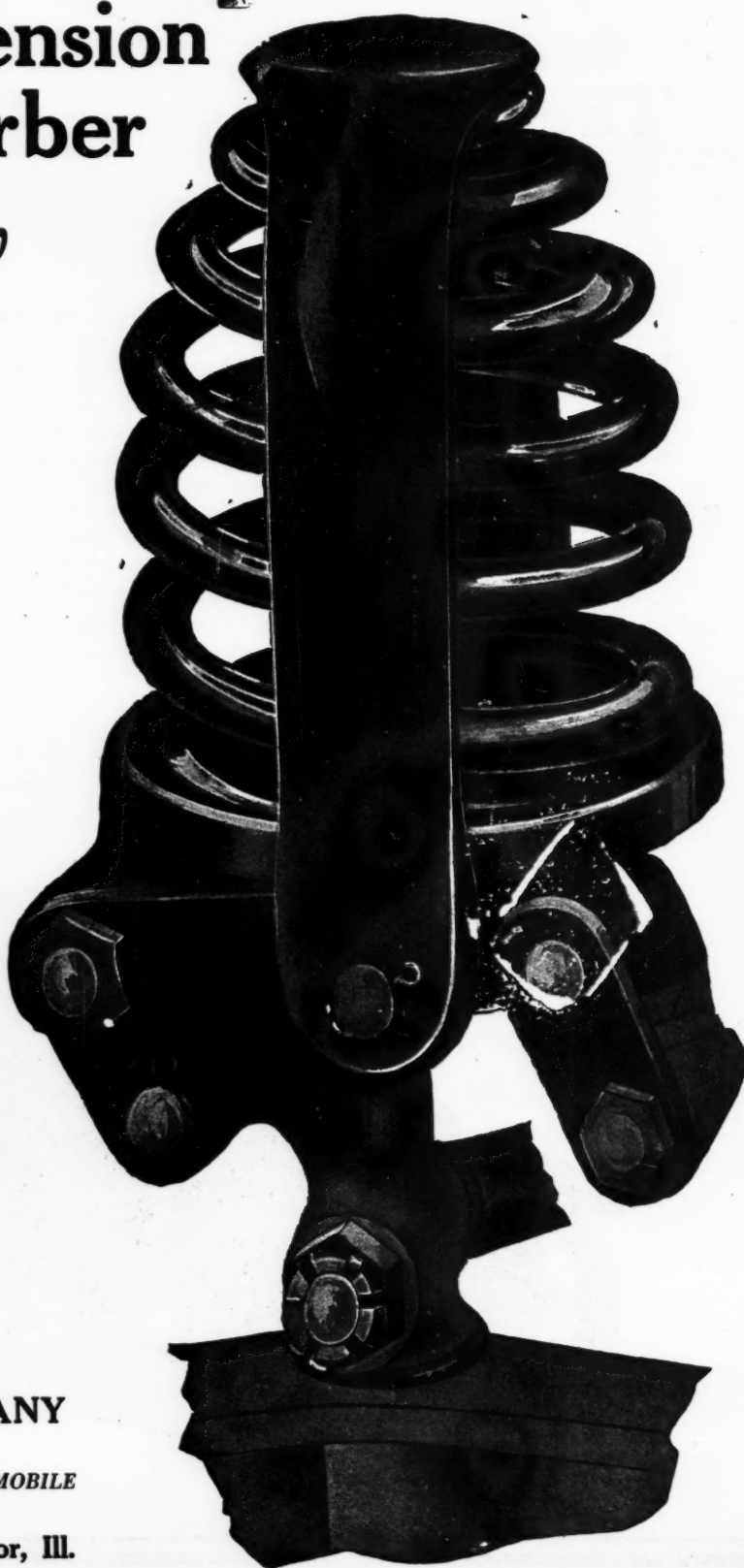
Write for full information today

L. P. HALLADAY COMPANY

Manufacturers of
**BUMPERS, SHOCK ABSORBERS AND AUTOMOBILE
ACCESSORIES**

520-530 W. Monroe Street, Streator, Ill.

When Writing to Advertisers, Please Mention Motor Age



Of course, your customer
doesn't ask for any
particular brake lining

IT'S YOUR function to decide
what brake lining you will offer
him. Your customer relies on your
mechanical knowledge to provide
good, safe brake lining for his car.

And when you tell him you handle
Non-Burn, you will find that he will accept
it eagerly. He knows Johns-Manville, with
its years of leadership in the manufacture
of asbestos products; he knows Non-Burn
Brake Lining is Johns-Manville Asbestos
for the motorists' service.

So when you handle Non-Burn, you
have the goods—and you can prove it.

See your Jobber and take advantage of
the present opportunities for brake lining
renewals.

H. W. JOHNS-MANVILLE CO.
New York City
10 Factories—Branches in 63 Large Cities

JOHNS-MANVILLE
ASBESTOS
NON-BURN
BRAKE LINING



Through—
Asbestos

and its allied products

JOHNS-MANVILLE
Serves in Conservation

Heat Insulations, High
Temperature Cements,
Asbestos Roofings,
Packings, Brake
Linings, Fire
Prevention
Products

JOHNS - MANVILLE
AUTOMOTIVE EQUIPMENT

CARRIES THE LOAD

TAKES THE THRUST

WHETHER or not
there are BOWER
bearings at other points
—put them in your
wheel assembly.



Make child's play
ANYWHERE
of load and thrust

BOWER
ROLLER BEARING CO.
Detroit Michigan

Exclusive Bower Features

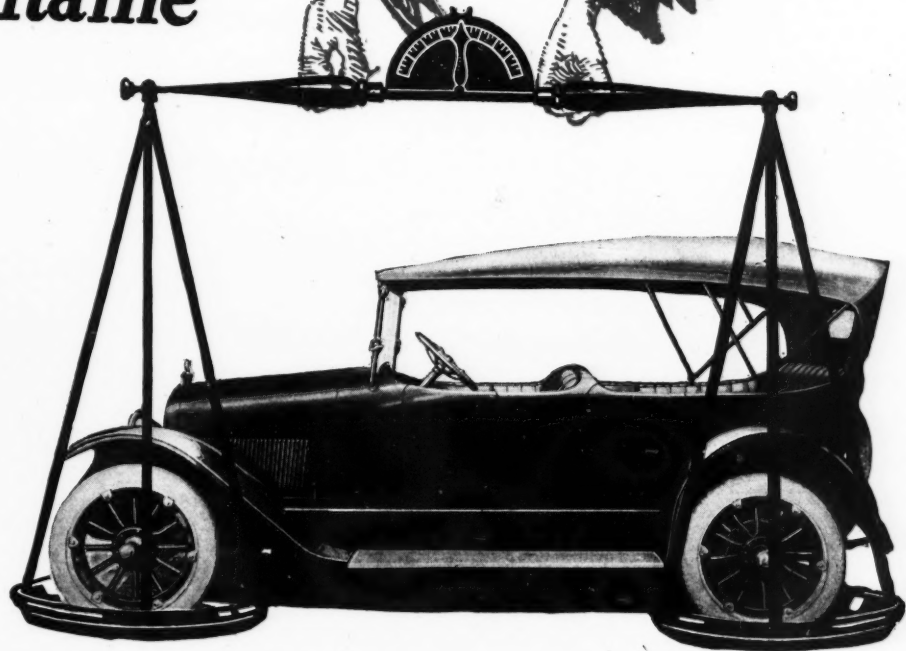
Separate bearing surfaces for load and thrust. Parallel raceways. Self-aligning. Never need adjusting. Does not develop end thrust under loads. Will not bind or end-slip.



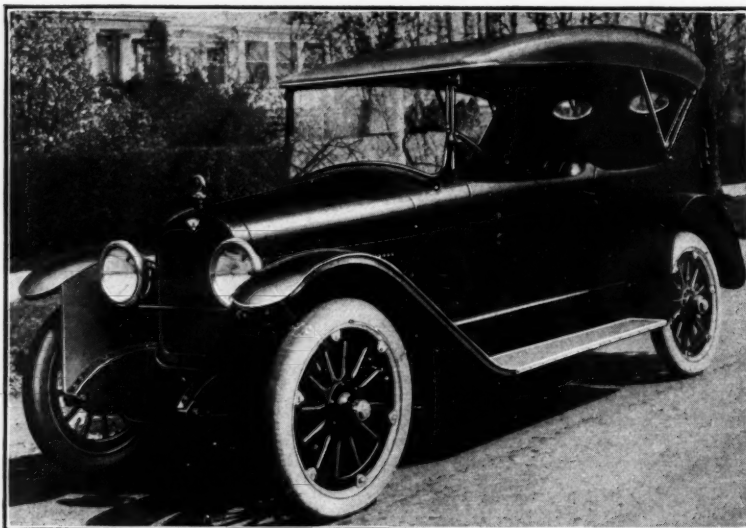
When Writing to Advertisers, Please Mention Motor Age



*As good as
its name*



AMERICAN
The Balanced Six



5-Passenger Touring Car
122-Inch Wheel Base
45 Horsepower

In its sturdy build, its honest clean-cut lines and unfailing all around dependability—in all that goes to make a car worth owning—the AMERICAN Balanced Six is **AS GOOD AS ITS NAME**.

Balanced with watch-like precision, the AMERICAN glides along the road with a cradling buoyancy that is immeasurably smoother, more comfortable and enjoyable than you ever experienced in a car of light weight.

The answer is found in the perfect, balanced design of this great car. Its weight is distributed over each of the four wheels almost to the fraction of a pound.

Wherever the AMERICAN is sold the demand for it grows rapidly. It is a car that owners exhibit with unusual pride and sing its praises with superlative interest!

If you are seeking a moderately priced car of thorough-going excellence, standard to the smallest detail of equipment, magnificent in appearance, unequalled in performance, you—whether dealer or owner—will do well to investigate further into the merits of the AMERICAN Balanced Six.

AMERICAN MOTORS CORPORATION
Factory and Sales Offices: PLAINFIELD, N. J.





USL
U. S. LIGHT & HEAT CORPORATION

machine-pasted plates make possible our long guarantee

Our exclusive machine-pasting process of making battery-plates has greatly increased the life of the storage battery.

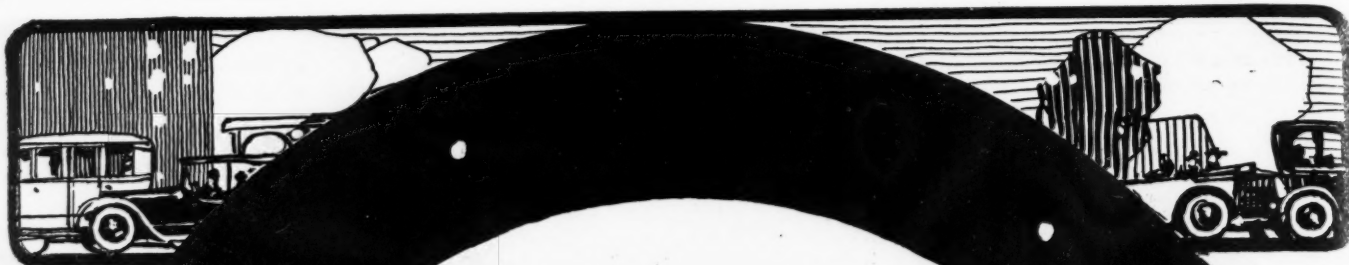
At the USL Factory, all uncertain hand-work has been done away with. USL battery-plate grids are placed in an ingenious machine and lead-oxide paste is quickly pressed in from both sides at once. This sets as a mass and the result is a compact, solid plate, uniform in density all the way through.

USL plates wear evenly, give off a constant and steady flow of power, do not crumble with vibration or road-shock and do not wash away.

As these long-life plates make a long-life battery, we guarantee the "USL" for 15 months on an adjustment-basis. Every USL Service Station stands ready to make good this guarantee.

DEALER'S—There's a USL story you will be interested in hearing. It tells you why the USL franchise in your territory is a valuable one. May we send it to you?

U. S. Heat & Light Corporation, Factory, NIAGARA FALLS, N. Y.
BRANCHES: New York Detroit Chicago Kansas City San Francisco Washington, D. C.



*This makes
any disc clutch
better*

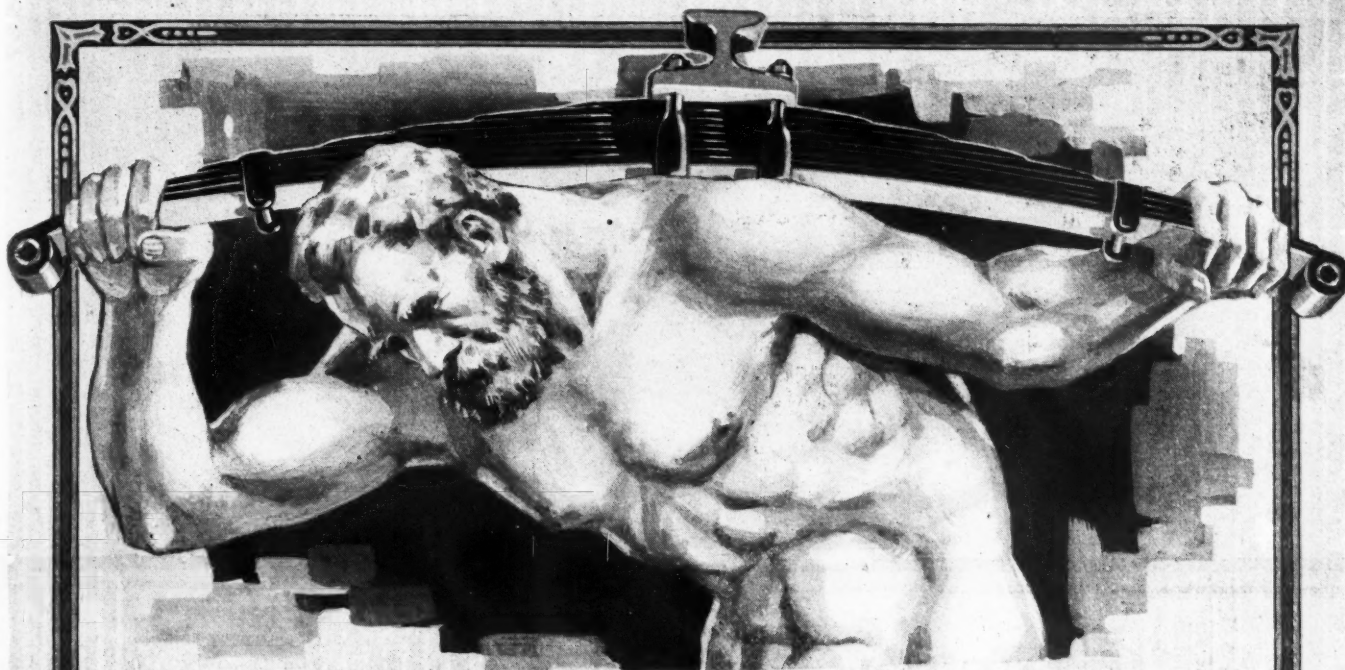
Raybestos

**Molded Clutch
Facing**

RAYBESTOS MOLDED CLUTCH FACING is so great an improvement over woven facing, that America's foremost car manufacturers have adopted it as standard. Our faith in the efficiency of this facing is so pronounced that we issue the following guarantee:

Should this facing break or fail to stand up, we agree to replace it free of charge and allow, not to exceed 8 hours labor costs for taking down and reassembling clutch if due to facing trouble. Guarantee covers six months' service on passenger cars and light trucks, extending from date of installation or purchase of new car. If RAYBESTOS MOLDED CLUTCH FACING does not substantiate our claims, return facings to us, together with repair bill for labor (not exceeding 8 hours) and we will promptly send you check.

The Raybestos Company - Bridgeport Conn.



HIGGINS QUALITY SPRINGS

for all
PASSENGER CARS AND TRUCKS

PROPER BEND WITH NO POSSIBILITY OF BREAKAGE

You Who Build Passenger Cars—You Who Build Trucks Consider This Particular Betterment

There's "give and take" quality in Higgins passenger car and truck springs. *Always, they give enough to take up the jar and jolt, but never enough to invite breakage—never!*

The relief they invariably give your vehicle from vibration, increases the reliability of that vehicle—increases its value to the user and its selling value to you.

The greatest progress ever achieved in Spring construction. No center hole—bolt—hump or weakness. Best grade of motor car spring steel of special analysis. Scientifically heat-treated. Factory tested for elasticity, tensile strength and anti-fatigue properties. It is to your interests—to the interests of your trade that you send us specifications of your requirements. *Now.*

Jobbers and Dealers in Replacement Springs

—our Replacement Spring line gives many exceptional opportunities for profitable trade increase. Send for catalog listing broadest and best of all Replacement Spring offering—reliable, ready for quick installation. Replacement Springs for practically all makes of automotive vehicles and QUALITY reputation that means ready sales.

HIGGINS SPRING & AXLE CO., Dept. 721,

Racine, Wis.

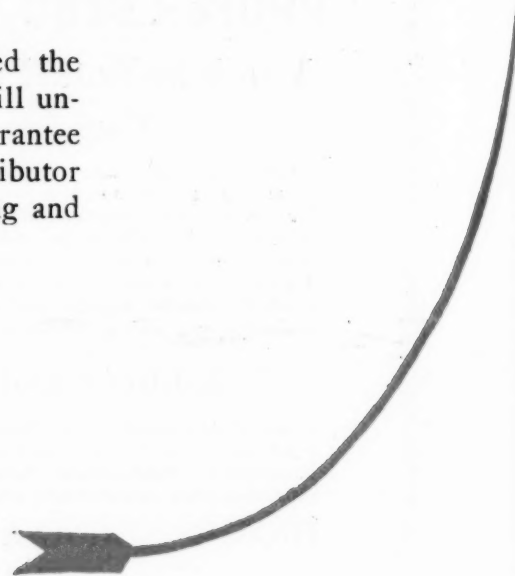
South American Representative, C. J. P. Lucas, Buenos Aires



THE Makers of National Speedway
Tires Have At Last Found a Cur-
ing Process That Absolutely Banishes
Blowouts, Rim Cuts and Stone Bruises

And now that they have remedied the adjustment evil, with a tire that will unfailingly outlive its 6000-mile guarantee they come to the dealer and distributor with a new policy of profit sharing and financial co-operation.

This is how it happened





STUDY the Curing Methods Now Universally Used, and You Will Appreciate the Need for a Process That Will Eliminate the Structural Defects in Tires.

THE average tire is assembled on an inflexible iron core.

Then this uncured assembly is laid in the lower half of a heavy two-piece iron mold, and then covered by the upper half. The mold remains open about half an inch—sometimes a full inch—because the unshaped tire has to carry an excess of tread stock to fill out the depressions in the mold's tread design (for non-skids).

This Is Where the Pinch Comes

To close the mold and keep it closed during curing, requires a crushing pressure of from 100,000 to 300,000 lbs. *And this is the mischief maker.*

Some slight error in assembling, trifling in itself, can grow into a serious flaw under this terrific external pressure. The fabric may be sheared off around the circumference of the tire. Generally this buckling is not visible in the finished tire, as the breaker strip prevents its showing on the tread. So when a premature blowout occurs everybody wonders why!

Rim Cuts and Jumpers

In clincher and Q. D. clincher tires the mold pressure frequently displaces the bead from its proper posi-

tion. The bead is crowded up into the sidewall—and rim cuts are the consequence.

In straight side tires the wire braid or cables in the bead may be pushed out of place by the mold pressure, and they fail to function properly as an anchor on the rim. That is what causes the tire to blow off the rim when attached and inflated.

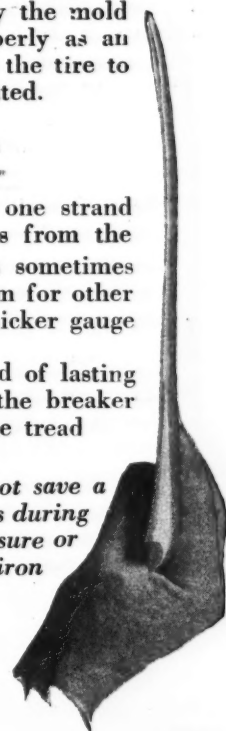
Stone Bruises

In the fabric used in good grade tires one strand is just as strong as another as it comes from the mill. But under pressure the fabric is sometimes pulled into a thinner gauge to make room for other stock finding a level, or pushed into a thicker gauge to fill out a light spot in the carcass.

That is another reason why tires, instead of lasting till the tread is worn right down past the breaker strip, will sometimes blow out before the tread has shown any particular sign of wear.

The finest materials in the world will not save a tire that has developed mechanical defects during the process of curing under external pressure or distorted during removal from a solid iron core.

Now turn to the next page and see what the internal hydraulic process has achieved



NATIONAL SPEEDWAY TIRES are Cured by Internal Expansion Under Hydraulic Pressure

"Since the discovery of this new method, National Speedway adjustments have averaged not more than one in every 2000 tires sold."—



Pres.

THE first thing we did was to abolish the solid iron core. In its place we use a collapsible core—in sections that can be taken apart. So when the fabric, bead, sidewall, cushion, breaker strip and tread are completely assembled the core is removed without destroying the shape of the tire. No chance for mischief here.

The Mold Is Completely Closed Before Pressure Is Applied

Next we take a specially constructed inner tube—of the exact inside dimension and shape of the finished casing—insert it into the uncured tire, lay the tire in the lower half of the mold, and the upper half over that.

The mold is made large enough to close completely over the tire, excess tread stock and all, before an ounce of pressure is applied. This is made possible by employing *internal pressure* instead of *external pressure* to fill out the design in the mold.

Water Pressure

The mold is placed in the vulcanizing kettle, and then a curious operation takes place—

Water pressure, up to 200 lbs. to the square inch, is pumped into the inner tube by an ingeniously devised method, and remains there till the tire is fully cured.

Mold Pinch Is Impossible

A mold can't do any pinching when its "pinchers" are kept closed.

Nor can any other distortion occur under the internal expansion process. Yet the hydraulic pressure exerted is tremendously powerful, so that the assembled parts of the tire are molded into a solid unit. *National Speedway Tires are cured under the precise strain they will meet with in road use.*

A finished National Speedway Tire is flawless—absolutely certain to deliver its full 6000 miles of guaranteed service and a big margin beyond.

None of the defects common to all other makes of tires can possibly creep in.

Every square inch of material is the finest grade obtainable. The tread is thicker than the requirements call for—having a greater rubber content than any other tire on the market, with but one possible exception. Yet National Speedway Tires are very light and resilient.

Though the National Speedway process is more expensive than the methods employed by other manufacturers, the resultant elimination of "seconds" and adjustments has so considerably reduced costs that we have been able to list National Speedway Tires lower than others of similar rating.

What are we doing for the dealer? See opposite page.

Some Good News For Dealers Who Are Looking For Worth While Profits And Real Co-operation

Just write for details, on your regular letter head, and Mr. Feist will tell you about the New Dealer Policy.

THE dealer is going to be a partner in the National Speedway business.

Our new trade policy gives him a vital interest in the future of this remarkable tire. And it is about the biggest future that a tire ever looked forward to.

The selling effort simmers down to a few brief words: "No blowouts, no rim cuts, no stone bruises. You will get 6000 miles and more *without fail*. No hidden flaws to develop trouble. These things have been banished forever by internal hydraulic curing. And no other standard make of tire sells for so little money."

That is the concentrated essence of sales-clinching tire talk. And no other tire has it.

So you can picture the demand for National Speedway Tires.

We are taking the dealer into partnership, because he will work harder for National Speedway if he shares bigger in the profits it produces.

ALL we ask him to do is to show his sincerity and ability. Once he proves up he need not worry about capital to develop his business in a big way.

For if he shows his mettle we will make him a proposition that will take care of his financing. Remember now: A great big share in the profits and necessary financial co-operation for the dealer who makes good.

And best of all—a tire that none can compete against.

You must get the full story. Ask for the details on your business letter head.

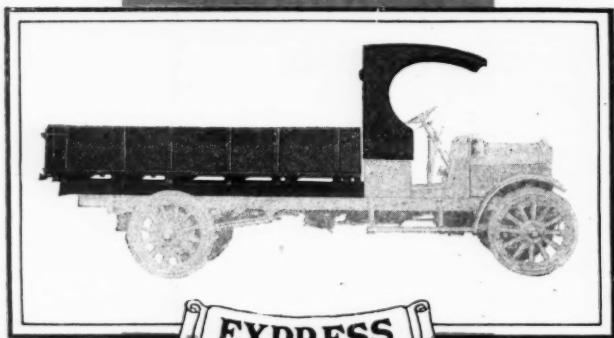
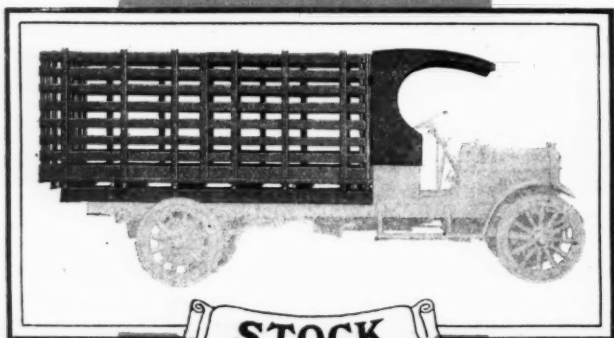
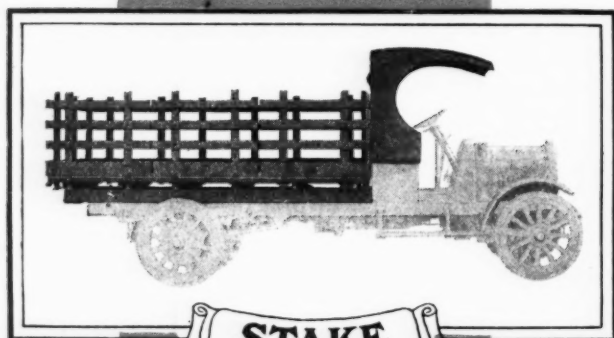
NATIONAL RUBBER PRODUCTS CORP.

*National Rubber Co. Bldg.
600-662 North Broad St.,*

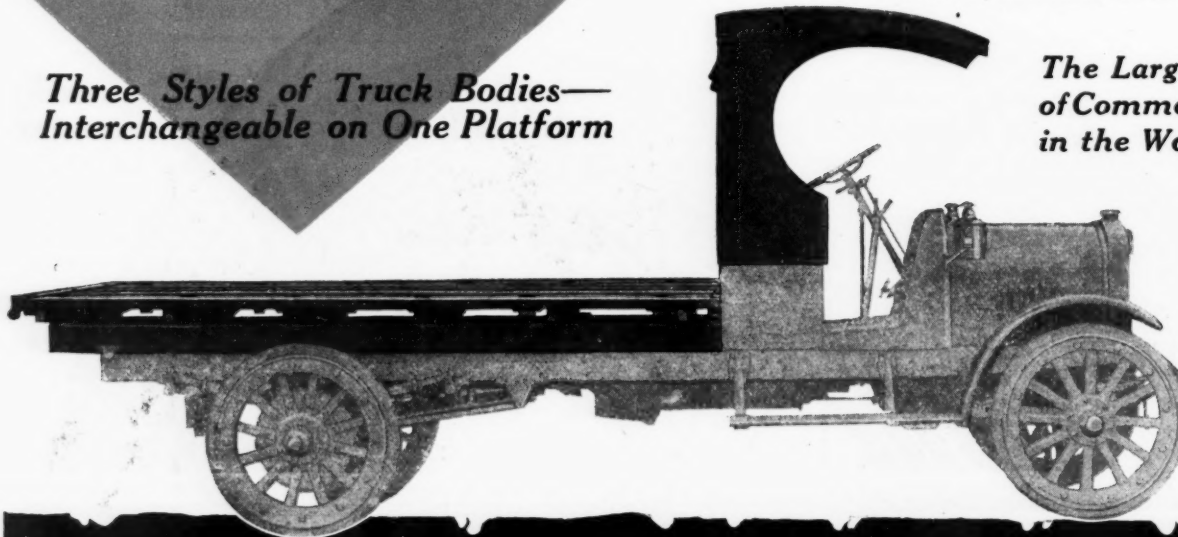
Philadelphia

Penna.



**EXPRESS****STOCK****STAKE**

*Three Styles of Truck Bodies—
Interchangeable on One Platform*



Built to Fit 1 to 3 Ton Trucks

Parry Multi-Service Bodies are built in lengths for medium and heavy duty trucks. 115 inch bodies for all chasses on which the length of frame from back of driver's seat does not exceed 115 inches. 130 inch bodies for all chasses where this same frame length is not more than 130 inches.

Not only do they fit your trucks, but they meet the needs of all your customers.

PARRY MULTI-SERVICE BODIES

give you three body styles in one. A well designed, strongly built platform, on which can be mounted three different equipments—Express Panels, Stock Racks or Stakes.

This is by far the best body proposition for every truck dealer.

It cuts down your body stock investment to a low figure. All you need is one type of platform for your chassis, and a small assortment of express panels, stock racks, and stakes. No need to carry a great variety of body styles and tie up your money.

Write or wire us today for dealers' price list.

Martin-Parry Corporation
INDIANAPOLIS, U. S. A.

*The Largest Builders
of Commercial Bodies
in the World.*



The classiest car on the road is the PACO equipped Ford chassis. The snappy lines of this super-racing body gives your Ford a smart look of distinction. Dress up your Ford in a PACO BODY and transform it into a fast, comfortable racer that will bring you real joy in driving on the speed paths or country roads.

Rough Going or Smooth PACO Racing Bodies WIN

PACO BODIES are built to withstand the shocks that comes from speed over a rut filled road. The long sloping lines of the hood blending in with the cowl, the receding rear end—were modeled after world famous racing cars. Besides having a foreign, speedy look, PACO BODIES are actually built for speed. They offer least wind resistance.

THE NEW PACO MODEL WITH SPORT TOP and WINDSHIELD

Another classy design is the new PACO BODY with Sport Top and Windshield. When you get this complete PACO equipment your car is ready for long tours and driving in all kinds of weather. The top is fashioned on real sporty lines, made of mohair and the speed windshield is tilted.

EXCLUSIVE

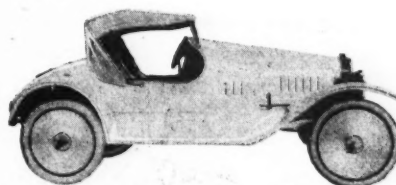


SPEEDSTER

There is only one genuine PACO. We manufacture it. We are patentees, sole owners and sole manufacturers of the PACO racing body. Paco designs are fully covered by U. S. Patents Nos. 50,218 and 50,448.

WRITE FOR FREE CIRCULAR

Write for complete description of Paco Bodies and illustrations from actual photographs. Send today for full information.



PACO Model 21

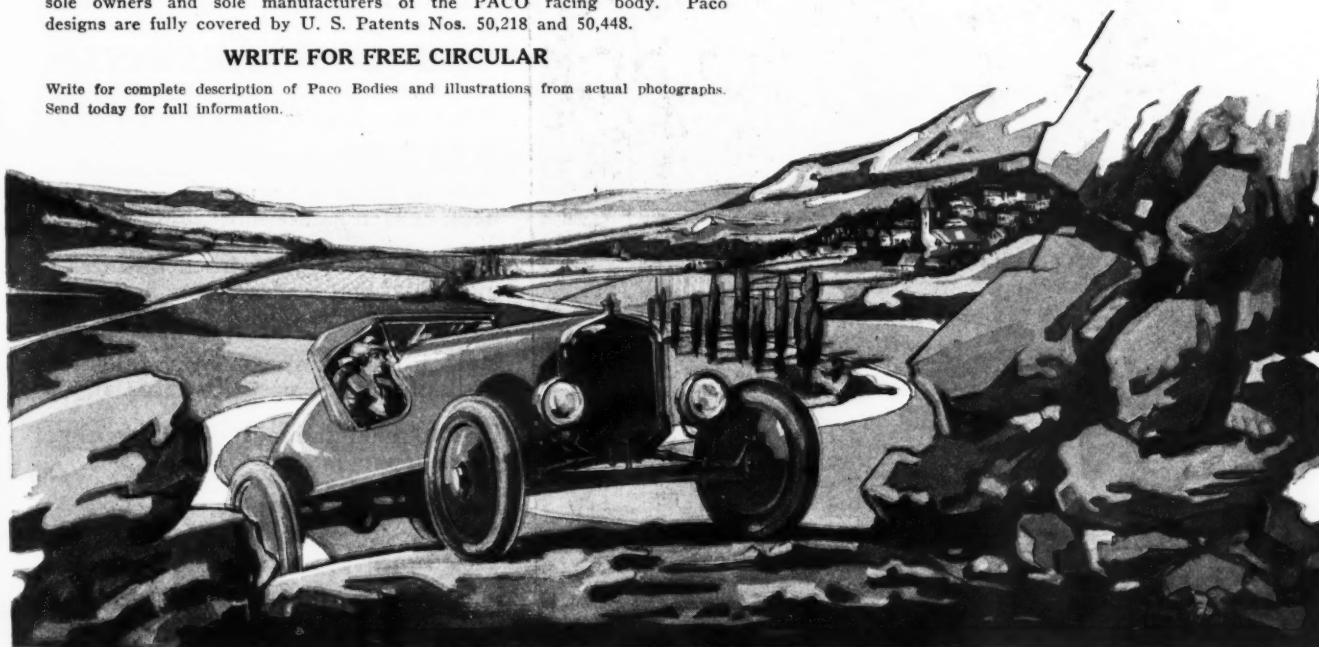
The above illustration shows Model 21, the most complete racing body of its type made. Rear end is torpedo shaped. Equipped with a 15 gallon gas tank with pressure pump and gauge. Illustration shows Model 21 equipped with Paco Sport Top and Windshield.

PACO MFG. CO.

Dept. M.

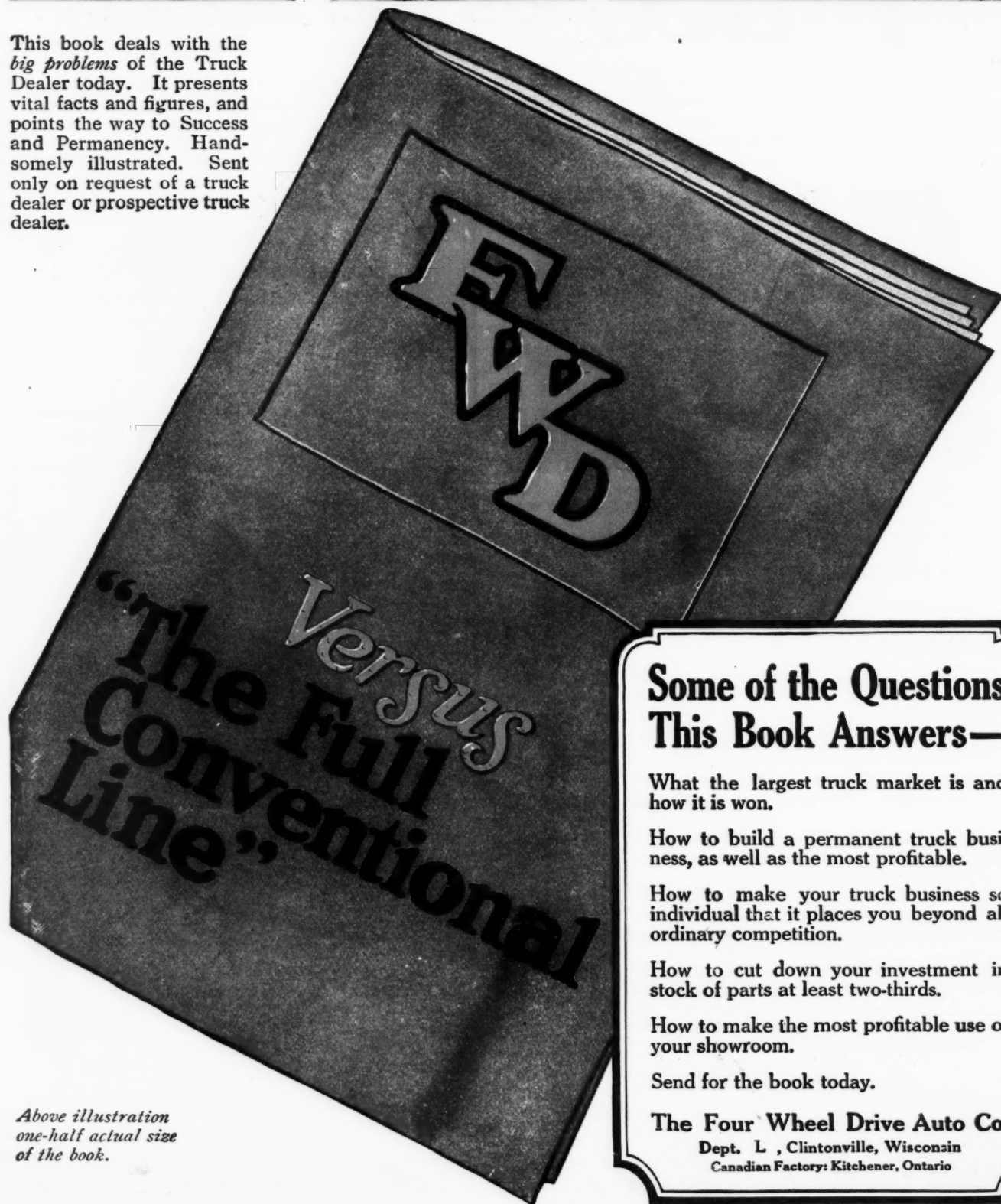
PEORIA,

ILLINOIS



New Light On The Retail Truck Business

This book deals with the *big problems* of the Truck Dealer today. It presents vital facts and figures, and points the way to Success and Permanency. Handsomely illustrated. Sent only on request of a truck dealer or prospective truck dealer.



*Above illustration
one-half actual size
of the book.*

Some of the Questions This Book Answers—

What the largest truck market is and how it is won.

How to build a permanent truck business, as well as the most profitable.

How to make your truck business so individual that it places you beyond all ordinary competition.

How to cut down your investment in stock of parts at least two-thirds.

How to make the most profitable use of your showroom.

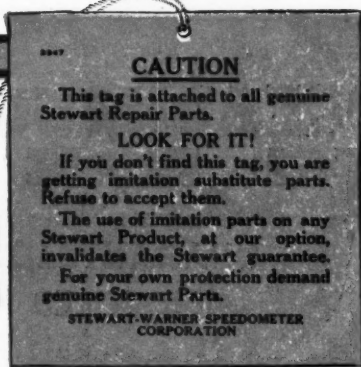
Send for the book today.

The Four Wheel Drive Auto Co.

Dept. L, Clintonville, Wisconsin
Canadian Factory: Kitchener, Ontario

"Look for the Red Tag"

*Advertisement
Number Five
of a Series*



This Red Tag identifies genuine Stewart Parts. For your own protection, as well as your customer's, demand it on the parts you buy.

"I didn't know it was an imitation part. I trusted the dealer."

THOSE are about the words we hear from car owners that come into our Service Stations every day for some repair on a Stewart Product.

Upon examining the faulty part we find that it is not a genuine Stewart Part, but an imitation. Invariably he informs us that he did not know he was getting an imitation; he thought he was getting a genuine Stewart Part.

If dealers will explain when they sell those imitation parts that they *are* imitations, the business will die a natural death.

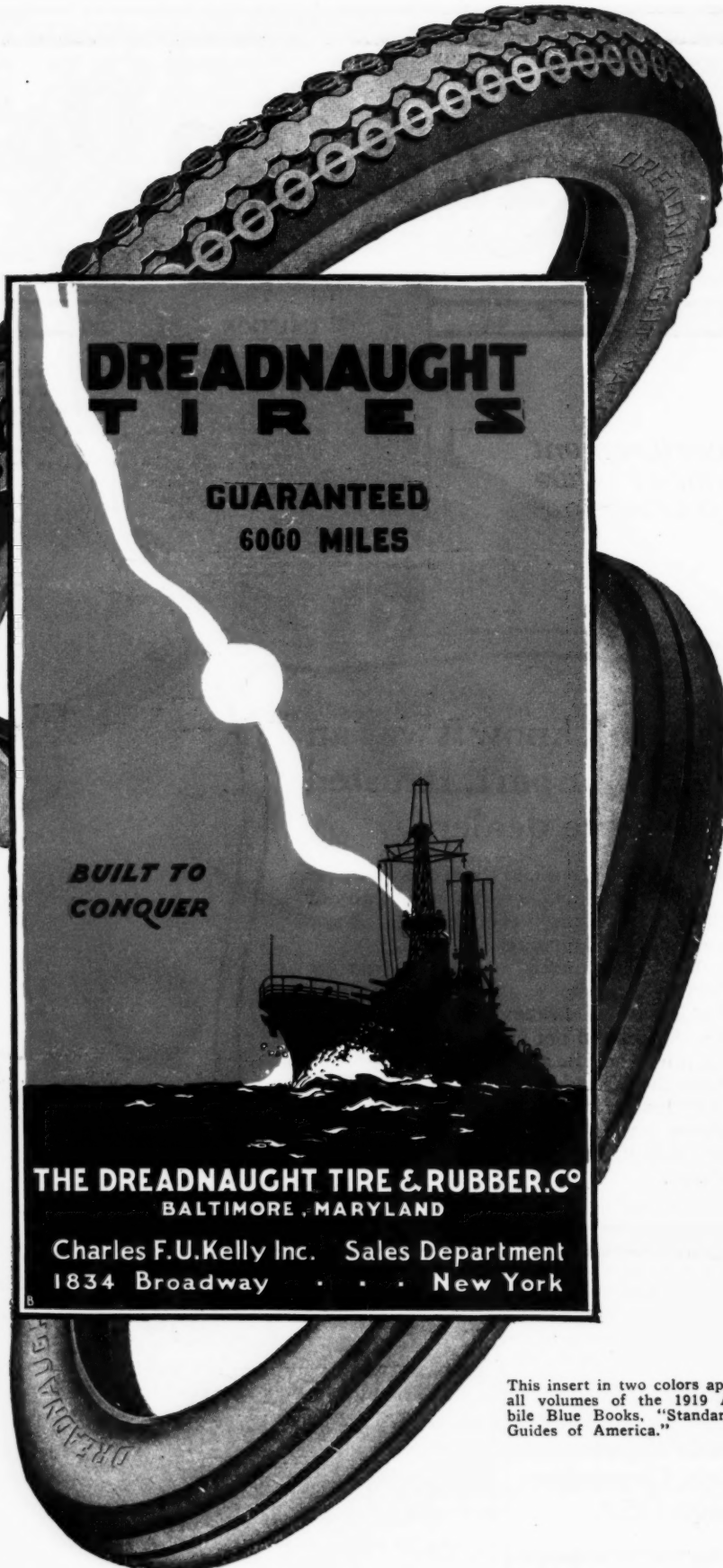
Therefore, sell only
GENUINE Stewart
Replacement parts

Stewart-Warner
Speedometer Corporation
Chicago, U.S.A.



Hang up this Sign


Will be sent Free



**DREADNAUGHT
TIRES**

**GUARANTEED
6000 MILES**

**BUILT TO
CONQUER**



THE DREADNAUGHT TIRE & RUBBER CO.
BALTIMORE, MARYLAND

Charles F. U. Kelly Inc. Sales Department
1834 Broadway . . . New York

This insert in two colors appears in all volumes of the 1919 Automobile Blue Books, "Standard Road Guides of America."

National BODIES for Ford Cars

Attractive Bodies that Attract Trade

You have to SEE this beautiful body to understand why it immediately appeals and *sells* to Ford owners who want a streamline touring type of body that will make their Ford look like a \$2,000 car. Our dealers report wonderful success, and fine profits. Right now is the logical time to show this handsome, attractive body to Ford owners in your territory.

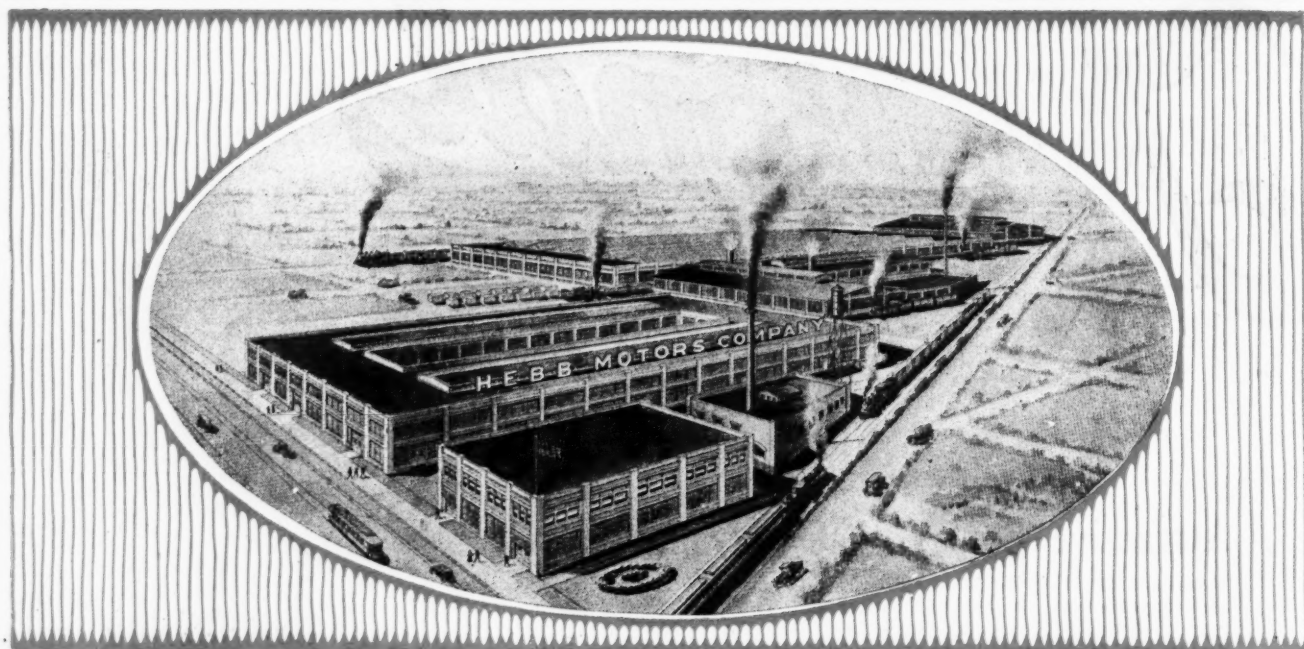
Notice the driver's roomy compartment—the large tonneau and the extra length of the body. Notice the double cowl, the perfect curves—the high radiator with shell somewhat like the Marmon, which gives a straight line from the radiator back. 20 gauge sheet steel over a hardwood frame with all joints mortised, glued, screwed and solidly ironed by hand. Upholstered with extra quality imitation leather and high grade cushion springs. One-man top and curtains—cowl-fitting windshield—instrument board—crowned fenders with aluminum bound running boards—and many other special features. Handsomely painted in rich, glossy black. Other colors extra. Built in a large plant by experienced body builders.

Our dealer's proposition is liberal and at present we can make prompt deliveries. But dealers are signing up so rapidly that our delivery schedule may soon be filled. Get in touch with us at once. Write for details today. Better still, wire us or send your order for demonstrator. Cinch the NATIONAL BODY line for your territory.

National Body Mfg. Co.

Nashville, Tenn.





★ ★ ★ PATRIOT ★ ★ ★

Motor Trucks

Behind every Patriot Truck there is an organization, a factory equipment and a financial strength that is unusual in the truck business—in fact, that is equalled by only a very few of the truck companies in America.

Patriot Trucks are built in one of the largest factories in America, costing upward of half a million dollars to build—located almost exactly in the center of the United States.

The main factory is 420 feet long by 240 feet wide, with two floors, containing 188,000 square feet of floor space, the entire building being devoted to the manufacture of Patriot Trucks. Two other buildings are used for the manufacture of bodies.

The saving in freight alone to western distributors is considerable, while the truck itself compares most favorably, in quality of material, workmanship, equipment and performance, with any of the better trucks of the United States.

Hebb Motors Company

Manufacturers

1391 P Street,

Lincoln, Nebraska

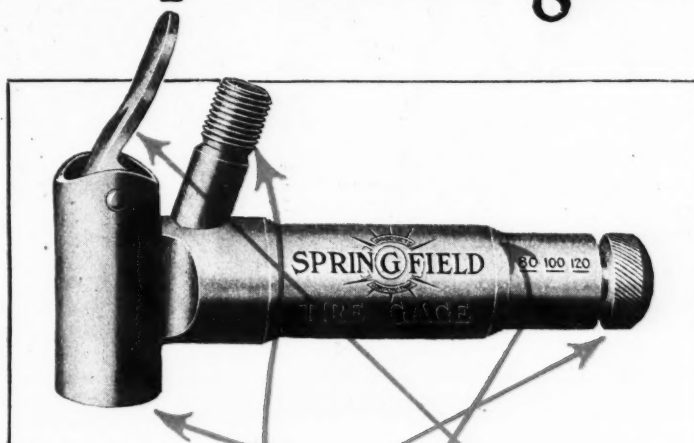
The illustration shows the Patriot Lincoln Model Truck, 1½ tons capacity, equipped with one of our farm bodies.



When Writing to Advertisers, Please Mention Motor Age

Your Customers Need the

Springfield Tire Gage an air pressure regulator



To regulate the pressure in your tires —

- A**—Turn this thumb screw until desired pressure is indicated here.
- B**—Set gage on valve stem here and pull this lever to lock in position.
- C**—Attach air line here (or have gage permanently attached to your air line) and start pump.
- D**—When indicated pressure is reached the automatic pressure regulator opens and no more air enters tire. The noise of the exhausting air warns you to stop pump or change gage to another tire.

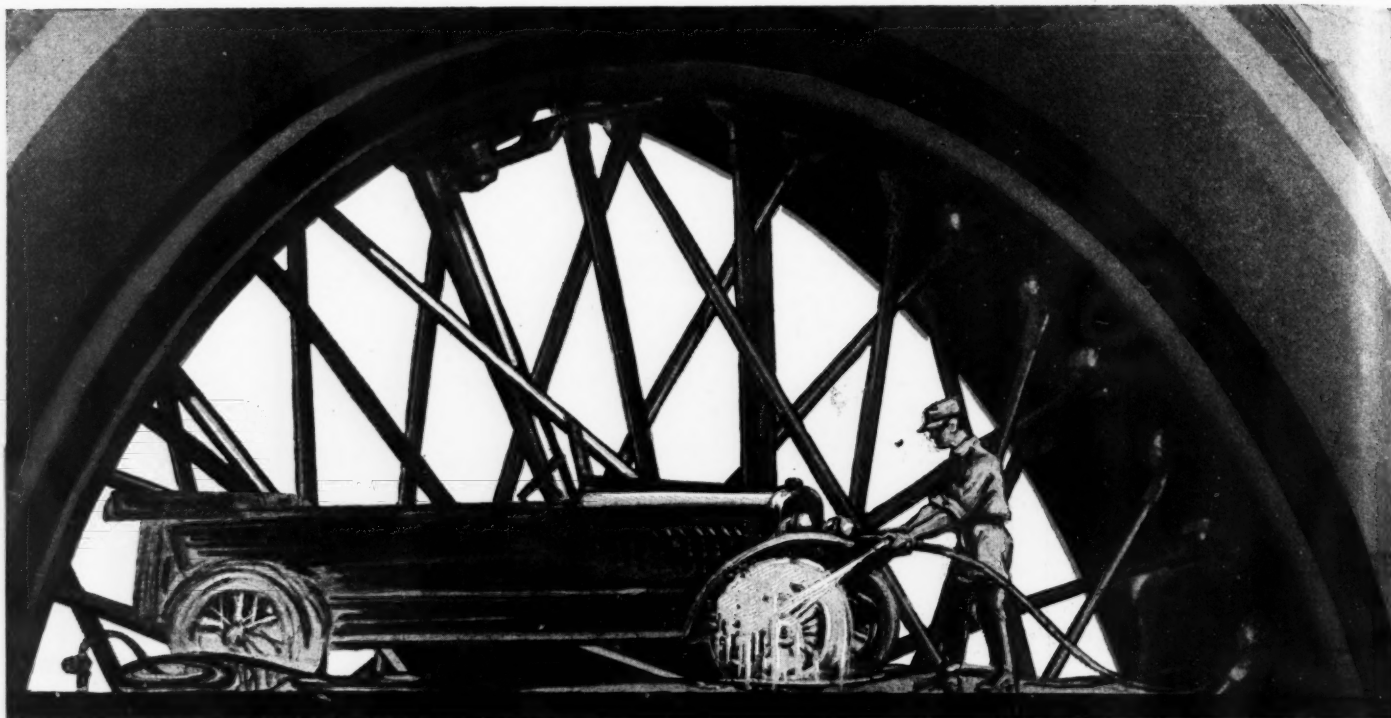


The Springfield Tire Gage, an air pressure regulator, is a new accessory—built to meet a need among motorists that could not previously be filled.

It will eliminate the bothersome alternate pumping and testing heretofore necessary to obtain anything approaching correct pressures—and will absolutely regulate to any desired pressure the amount of air you can put into your tires.

The Springfield Tire Gage is built with the precision of a rifle and guaranteed to be accurate. It is handsomely finished and packed in a leather case which fully protects the gage. The retail price is \$3.00.

Springfield Products Corporation
Springfield • • • Massachusetts



Wash Them as Often As You Like

THEY are so easy to wash—and you need not be afraid of rust, because PASCO WIRE WHEELS are RUST PROOF. The use of a Standard Wire Wheel cleaning brush makes the job a light one, and when you finish each spoke shines in its original lustre and beauty.

The motorist who buys PASCO WIRE WHEELS (the number increases every day) thinks not only of the improved appearance but of the economy, the strength, and the safety of PASCO Wheels. They are easy on tires because of their perfect balance and method of suspension spoke lacing which shares with your tires, and thus diminishes the wear due to road shock.

PASCO WIRE WHEELS are five times stronger than

wood wheels of the same size—the reason for this is the heavy PASCO Spoking. Then there is the safety feature, the full importance of which motorists seldom recognize until accident comes to him who disregards it. The Safety Locking Device on PASCO WIRE WHEELS makes it impossible for them to come off.

All in all there is no other wire wheel that measures up to PASCO strength and durability. And beauty—the massive hub cap and full spoking gives PASCO a refinement that is unfailing in its appeal to the discriminating motorist.

The PASCO dealer is always prosperous—now is YOUR opportunity.

NATIONAL WIRE WHEEL WORKS, Inc.

Plant No. 1
Geneva,

General Sales Office:
416-417 Book Building, Detroit, Mich.
Northern Electric Co., Ltd., Montreal, Canada

Plant No. 2
Hagerstown, Md.

PASCO

WIRE WHEELS

Pasco Wheels Cannot Run Off

When Writing to Advertisers, Please Mention Motor Age



Jack your car on ball bearings

A FEW easy turns on the long handle and your car is raised. To lower it, merely reverse the turns and pull the jack out by the handle. You perform every operation without once getting under the car.

The diamond point hardened steel top with BULL-DOG grip bites the axle and holds it firm. There is no danger of slipping. You can avoid having the tire rim fall on a deflated tire.

Kimball Jacks sell fast because every time you use this jack you give a demonstration. Motorists everywhere want the Kimball because it is reliable and easy to use. Stock it and sell more jacks.

PRICES			
Size	Medium Height	Extended Height	Price
No. 1	9 in.	15 in.	\$7.00
No. 3	11 in.	18 in.	7.00
No. 4	12 in.	20 in.	7.00

Kimball Special Truck Jack that easily raises any style truck sells for \$15.00.

SALES DEPARTMENT

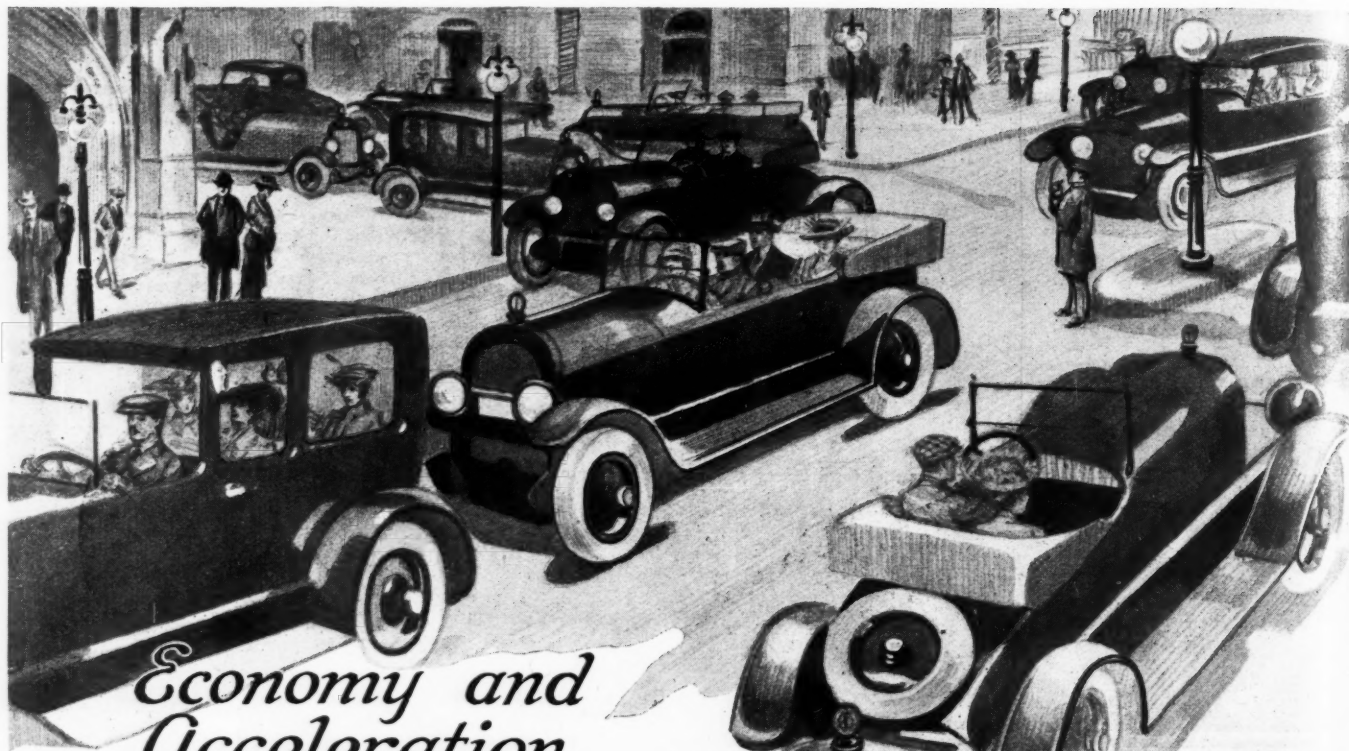
EDWARD A. CASSIDY COMPANY, Inc.

Madison Avenue at 40th Street, New York

Manufacturers: F. W. MANN COMPANY, Milford, Mass.

Every operation of raising and lowering without even stooping. You can avoid dirt and grease. Eliminate all chance of ruining clothing and injuring hands.

KIMBALL AUTO BALL BEARING JACK



Economy and Acceleration In Traffic



THE New Stromberg Carburetor answers demands with a "hair trigger" impulse. In congested traffic when quick action is essential—you get action without hesitation. Just enough—no more. A quick-as-a-flash start. A clean shut-off when you want it. No flooding—no choking—no waste. A rich mixture and the right amount for the need.

The extreme of gas economy. The greatest of engine efficiency. A carburetor perfectly attuned to *all* ranges of motor activity.

Many world records for speed, power and economy constitute convincing evidence of Stromberg superiority.

Write for literature. State name, year and model of your car.

Stromberg Motor Devices Co.
Dept. 727, 64 East 25th Street
Chicago, Ill.

New STROMBERG Does it! CARBURETOR

SELECTION OF THE RIGHT LUBRICANT FOR THE NC-4 FLEET

IT is not our desire to snatch one mite of the homage and credit due the intrepid and fearless crew who took their lives in their hands and sailed out into the unknown—but efficient, perfect and constant lubrication was the greatest factor in the ultimate success of this adventurous trip. Hence, the Navy left nothing to chance. Grilling, practical tests, scientific investigation, exhaustive research, were all combined against the possibility of disastrous engine troubles resulting from poor lubrication.

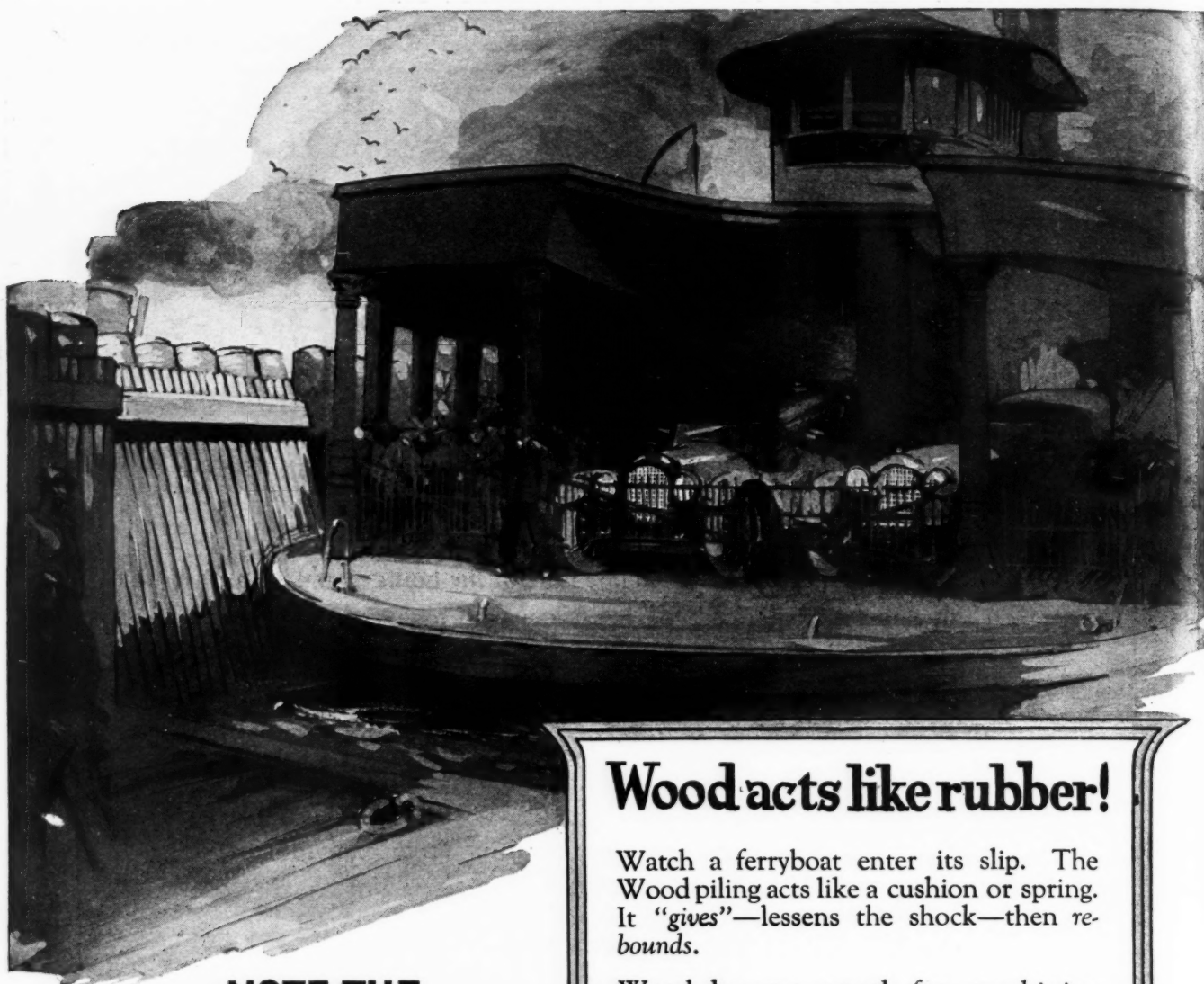
The choice of GULF LIBERTY AERO OIL, therefore, was made with a positive knowledge that it would fulfill every requirement, and the success of the NC-4 has proven the wisdom of the choice.

Supplied by

Gulf Refining Company

Manufacturers of

**SUPREME AUTO OIL AND THAT
GOOD GULF GASOLINE**



**NOTE THE
WOOD WHEELS
EVERYWHERE**



Wood acts like rubber!

Watch a ferryboat enter its slip. The Wood piling acts like a cushion or spring. It "gives"—lessens the shock—then rebounds.

Wood has no equal for combining strength with resiliency. WOOD Wheels for ages past have served to lessen the shocks to vehicles and their contents—and they always will.

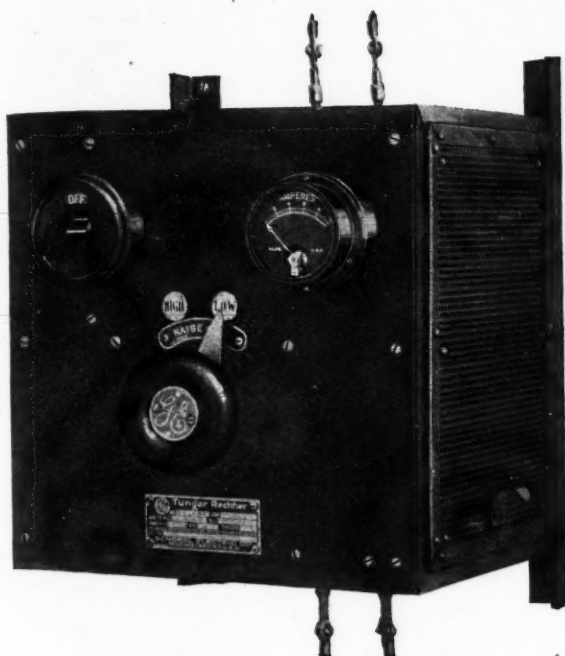
WOOD Wheels are time tried—and proven. The more thought you give to the kind of wheels to use, the more surely will you appreciate the advantages of Wood over all other materials.

**AUTOMOTIVE WOOD WHEEL
MANUFACTURERS' ASSOCIATION**

105 West Monroe Street

Chicago, Ill.

WOOD WHEELS
for MOTOR VEHICLES



75 volt outfit—charges 10 batteries at one time

Tungar

RECTIFIER

*Simplicity
Reliability
Efficiency*

TUNGAR SIMPLICITY

The Tungar has no moving parts requiring attention.

The Tungar can be operated by anyone.

A snapswitch turns the current on and off.

The ammeter indicates the current flowing to the battery.

The current can be regulated from one to six amperes by means of the dial switch.

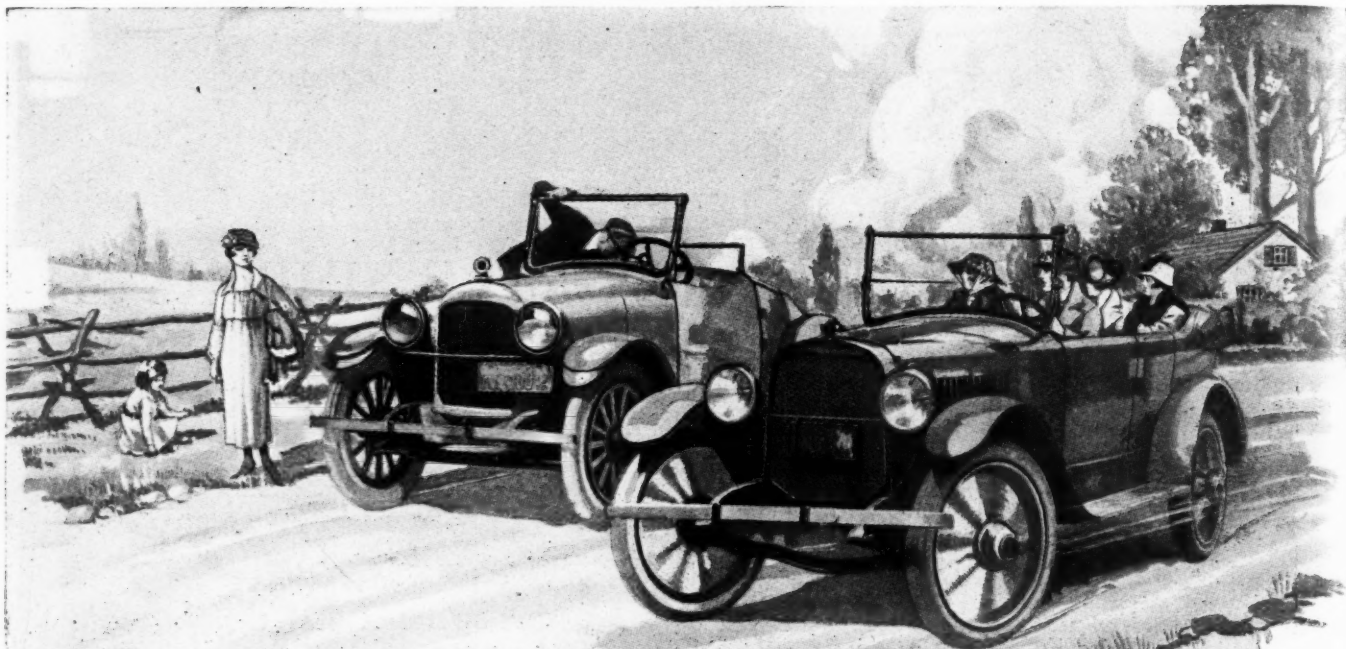
The installation is very simple—mount on the wall—connect A. C. to A. C. terminals of the rectifier—connect D. C. leads to the batteries—Turn on the snapswitch and start charging.

There is a Tungar distributor
in nearly every large city
Ask us his name

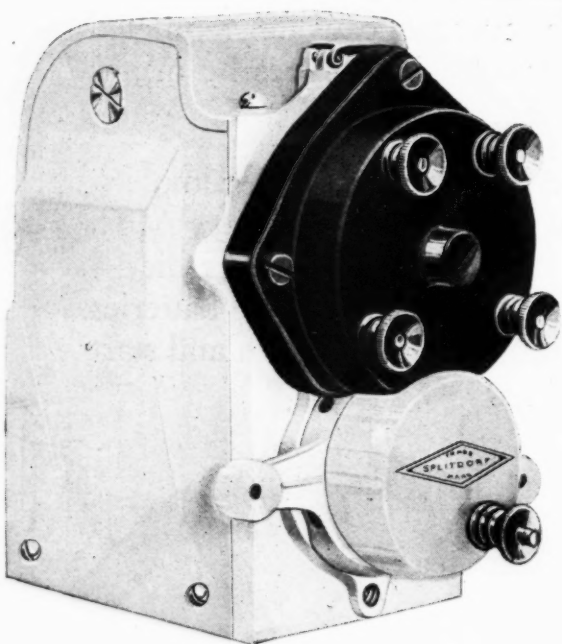
General Electric
General Office **Company** Schenectady, N.Y.

35A-31

When Writing to Advertisers, Please Mention Motor Age



Makeshift ignition or dependable ignition?



Is your whole car helpless when your starting and lighting system gives out—when you forget to do one of the many things necessary to keep the overworked starting-lighting-ignition system in order?

Is your engine handicapped by one of those "Jack-of-all-trades" ignition systems that, after it has spent itself to light a half dozen lights and start your husky engine, feebly attempts to fire the cylinders?

Or is it one of those sensitive, high-strung, powerful engines of stamina and endurance that answers your every wish, almost before you have wished?

Is your engine, in short, retarded by a makeshift ignition whose only excuse is that it saves the manufacturer money—or is it helped and invigorated by a self-contained, independent, dependable magneto, that in the end saves *you* money?

Be sure your next car is equipped with a Splitdorf Magneto. It is as far above other magnetos in simplicity of construction and dependability as magneto ignition itself is above battery ignition.

SPLITDORF

Electrical Co., Newark, N.J.
Sumter Division, 1466 Michigan Ave. Chicago



Manufacturers of AERO, DIXIE and SUMTER Magnetos, Oscillating Magnetos and Starter Couplings

When Writing to Advertisers, Please Mention Motor Age

When Springs Break

put on

VULCAN

QUALITY
The Replacement Spring



The VULCAN Name-plate insures absolute protection to the dealer.

When you sell a replacement spring bearing the round VULCAN name-plate you know that spring has been made right and will give complete satisfaction. It protects your future business and your profits.



Unscrupulous jobbers have substituted inferior springs for VULCANS, in the past. We want every dealer to realize that the VULCAN name-plate is his assurance of real VULCAN quality and VULCAN profits, which are high. Look for the name-plate on every spring; when you find it you know you're right.

*The VULCAN name-plate is a symbol of
Protection and Profit to every dealer.*

Jenkins VULCAN Spring Co.

Factory

RICHMOND,

INDIANA

Branches

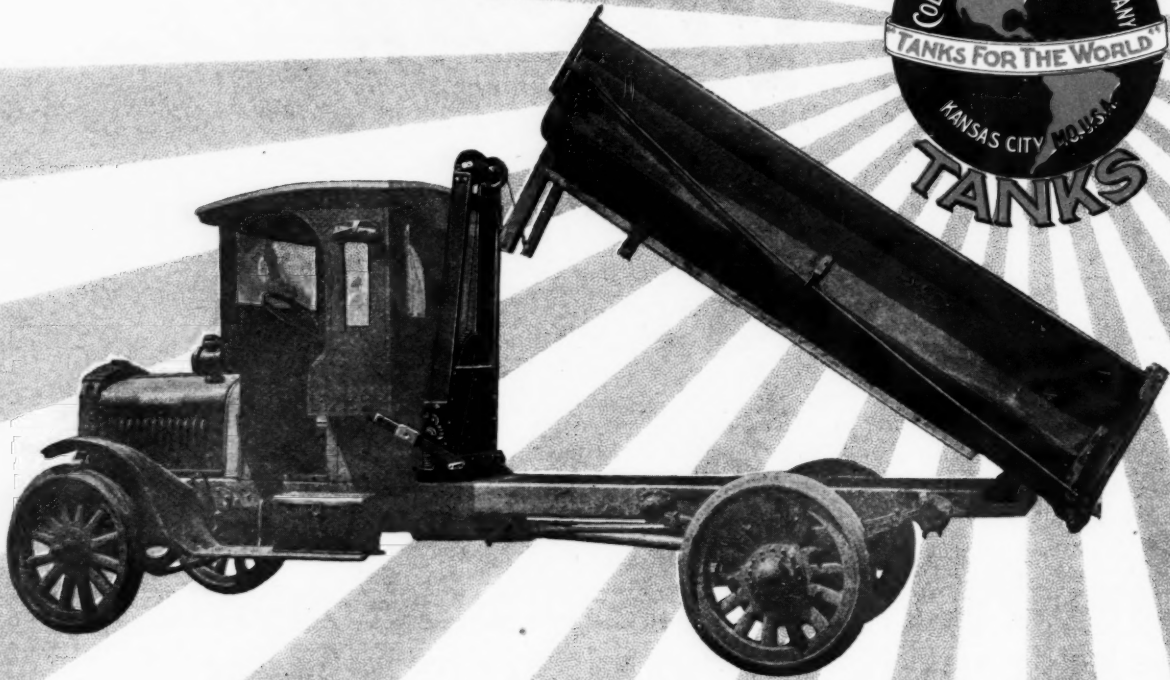
Atlanta, Ga.
Boston, Mass.
Dallas, Tex.

Kansas City, Mo.
Minneapolis, Minn.
Reading, Pa.

St. Louis, Mo.
Sumter, S. C.

Get our **FREE Service Sign** and
Display Rack with first order.

IN
EVERY TOWN
for EVERY CAR



**You Will Get Better, Faster Service
at Lower Cost from**

COLUMBIAN DUMP BODIES and HAND HOISTS

You can no longer afford to let men shovel loads from your trucks to the street. Men's time is too valuable and continuous service from your trucks too essential for proper returns on the investment you have made.

COLUMBIAN Dump Bodies, with Hand Hoists, solve the problem of quick handling of your loads. One man can dump a load up to five tons in half the time it would take a gang of men to get a good start with shovels.

Your trucks will make more trips, your labor will cost you less, your profit per ton-mile will jump over night when you install COLUMBIAN Dump Bodies and Hand Hoists, and start to use them.

Write today for free illustrated catalog No. —. Let us show you how best to use COLUMBIAN equipment in your particular business. We can do it. Ask now.

COLUMBIAN Dump Bodies are built in every style, for handling every kind of load and for every truck chassis. COLUMBIAN Hand Hoists can be used with any dump body. Simple in construction. Quickly installed without drilling holes.

Columbian Steel Tank Co.

**ESTABLISHED
IN 1894**

"Tanks for the World"

1601-21 W. 12TH ST.

Dept 74

KANSAS CITY, MO.

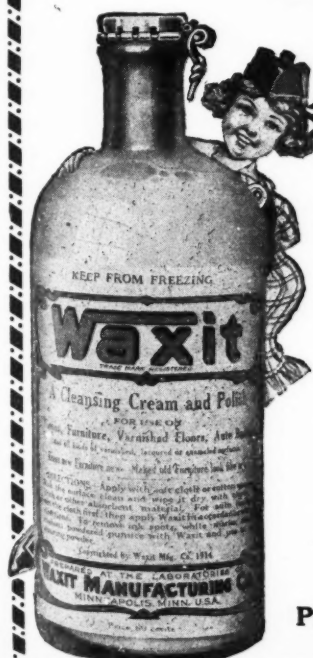
Better than ELBOW Grease for Cleaning and Polishing Your Car



Water ruins finish. Waxit benefits it. Cars that are continually washed soon become checked. The finish gets dimmer and duller. Cars that are cleaned and polished with Waxit hold their new appearance. The finish stays *live* and *elastic*.

Waxit

"The Perfect Polish"



is cleaner and polish combined. Moisten a cheese cloth with it. Rub lightly over the surface of the finish. Off comes grease, dirt and streaks—back comes brilliancy of finish. Without hard rubbing and in a jiffy it is shining like a mirror. Waxit gives a hard-dry finish. Far superior to a dust-gathering film of oil.

The owners of the finest cars instruct their chauffeurs to use nothing but Waxit. It is the very same polish that the housewife uses on her mahogany piano and fine furniture. The finest thing of its kind on the market.

THE SALES OF WAXIT ARE GROWING FAST

Because Waxit has the quality in it that **MAKES IT SELL**. It does a better and quicker job of cleaning and polishing than any other preparation. It is beneficial to the finest finish. WRITE for full sized package—we'll gladly send it gratis—and our dealer's proposition. Mail the coupon.

Waxit Manufacturing Co.
Plymouth Bldg. Minneapolis, Minn.

WAXIT MFG. CO., Minneapolis, Minn.
Kindly send me full sized bottle of Waxit and your proposition to dealers. My dealer's name is:

Name _____ Address _____ City _____ State _____

The JULY issue of
The TIRE RATE BOOK
 will be ready for distribution on
JULY 15th

Is your order on file to secure a copy of this most
 valuable issue containing all new prices as of June 15th?

SEND US YOUR ORDER NOW

To delay entering your name on our subscription list
 may result in your order reaching us after our
 supply of this issue is exhausted. It contains:

Over 180 pneumatic tire price lists
 (of which more than 130 are advertised)

Nineteen solid tire price lists
 (of which 8 are advertised)

Ten rim price lists
 (of which 9 are advertised)

476 PAGES

Each chock full of tire information

Act on that Impulse **NOW**

This subscription blank is for your convenience

The Tire Rate Book,
 239 West 39th St., New York City

Please enter my order for — subscriptions of The Tire Rate
 copies

Book, for which I enclose \$.....

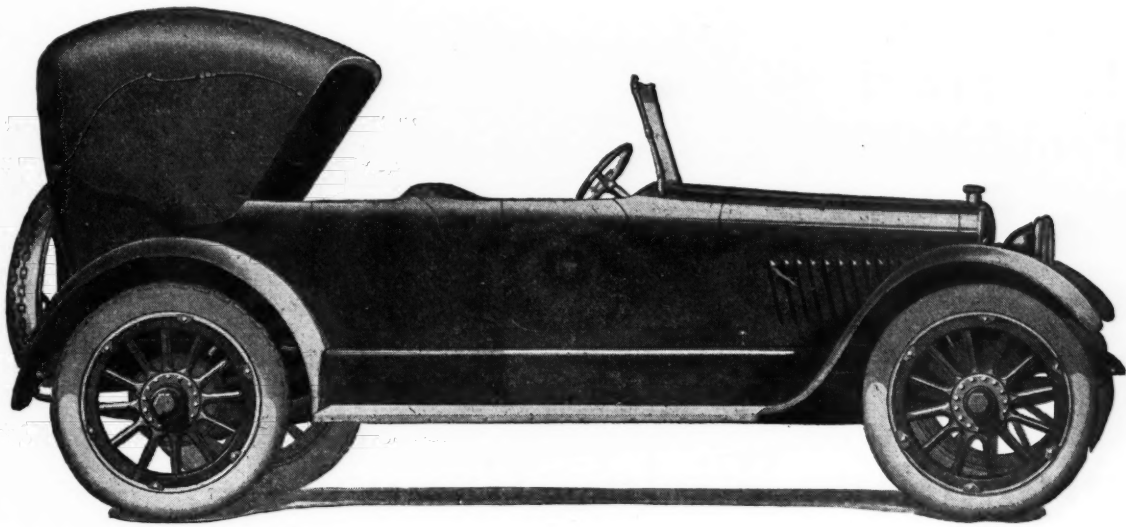
Subscription price \$1
 per year. 35c per
 copy. Subscriptions
 will begin with the
 July issue.

Name
 Address
 City

**The
 Tire Rate Book**

239 West 39th St.
 New York City

Published by
 The Class Journal Co.



The word **SERVICE** is the strongest word in automobile usage—it means most to the dealer and owner.

If every purchaser of an automobile were to secure the service which he anticipates the day that he buys it, he would never drive any other make of car. But why the frequent change of cars with each consequent depreciation?

Was his car too hastily built,—

Quantity production instead of quality production?

Was it because his car was neither finished nor properly tested at the factory?

Some automobiles receive no driving test. Some cars are built in such quantities that it is impossible to secure sufficient number of conscientious, efficient testers to test them properly.

Consider the established fact, that the car or cars exemplifying the highest quality in each respective class of automobiles are produced in factories of comparatively small production.

Monitor cars are built as you would build a car for your own use. Each car is subjected to an exacting road test.

Monitor cars are built according to an established standard of quality,—every car must qualify according to the standard test before delivery is permitted.

A Monitor owner continues a Monitor owner, satisfied that he is the owner of the "Car of Service Unexcelled."

Red Seal 7 W Continental Motor
Borg & Beck Clutch
Grant-Lees Transmission
Floating Type Rear Axle

Stromberg Carburetor
Stewart Vacuum
Stewart Speedometer
Dyneto Generator and Starter

A catalogue of special interest to dealers and distributors will be mailed on application.

TOURING CAR OR ROADSTER \$1475.00 SPECIAL MODELS

THE MONITOR MOTOR CAR COMPANY

Cleveland and Mount Vernon Aves.

Columbus, Ohio

PERMIT US TO SUGGEST THAT YOU READ THIS NOTICE ALOUD

Never Be in Doubt Over Electrical Problems

You need not be, and you can do five times more effective and profitable work every day in the week by using the



Automotive Wiring Manual

—formerly—

Official Auto Wiring Guide

Think what it will mean to you to know the electrical system of any car, and the internal wiring of the generators, starters, cutouts, switches, coils, etc., of any of the many starting, lighting and ignition systems like an open book.

Quit Guessing—Know!

Your reputation as an electrical expert will not be made through an occasional lucky guess. You should know and know every time just what you are doing.

The AUTOMOTIVE WIRING MANUAL will help you to quickly solve each and every electrical problem on any car. It shows in blueprint form a guaranteed accurate diagram of the exact wiring of all cars from 1912 to and including 1918 models; also motor trucks and motorcycles. Over 700 distinct diagrams in all; more than 100 being internal diagrams of generators, starters, controllers, switches, etc. Practical instructions on the repairing of batteries, coils, motors, etc., are included.

Special Price

\$12.50

Delivered



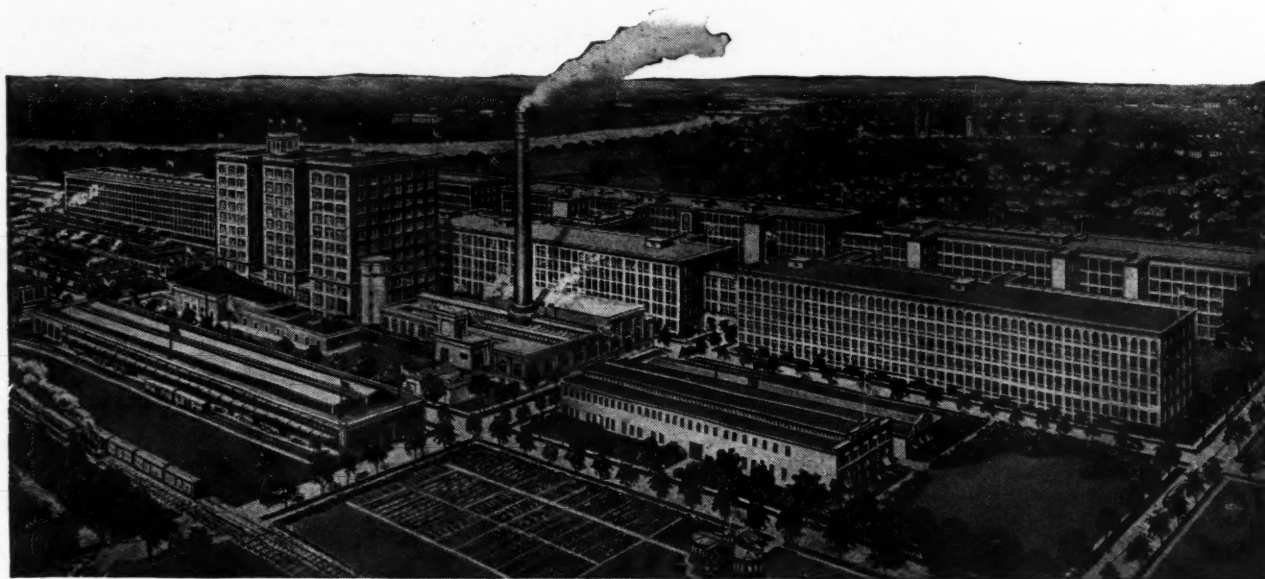
Regardless of what you may or may not know the AUTOMOTIVE WIRING MANUAL (formerly Official Auto Wiring Guide) will prove the best investment you can make, and will pay the highest interest. Each day you are without one you more than lose its cost to you.

*Make the right start now
by ordering your copy from*

U. P. C. BOOK COMPANY, Inc.,

Book Departments of Motor Age, Motor World and Automotive Industries

243-249 West Thirty-Ninth Street New York City



We make more than 275 National Cash Registers every day

The National Cash Register is a modern, labor-saving machine that helps merchants, clerks, and their customers.

It protects profits by stopping leaks and losses, temptation and mistakes.

It adds, records, and classifies many kinds of transactions.

It saves time and money because it does 15 things in 3 seconds.

It enables the merchant to give quick, accurate service.

It more than pays for itself out of what it saves.

It helps merchants make more money, with less expense.

This big plant makes nothing but National Cash Registers

**The National Cash Register Company
Dayton, Ohio
Offices in all the principal cities of the world**

When Writing to Advertisers, Please Mention Motor Age

Unusual Conditions

An occasional service station requires a large storage tank to serve an emergency—a sudden heavy demand for air. Between these rush periods are long intervals. The Brunner line, including an outfit for every conceivable garage condition, includes an outfit exactly suited to this special case.

The No. 541 as illustrated, with automatic controller, will be ready for the emergency and yet prove most economical. The outfit is specifically suited to stations having spasmodic rush hours. This is a complete assembly, ready to run when removed from its crate.

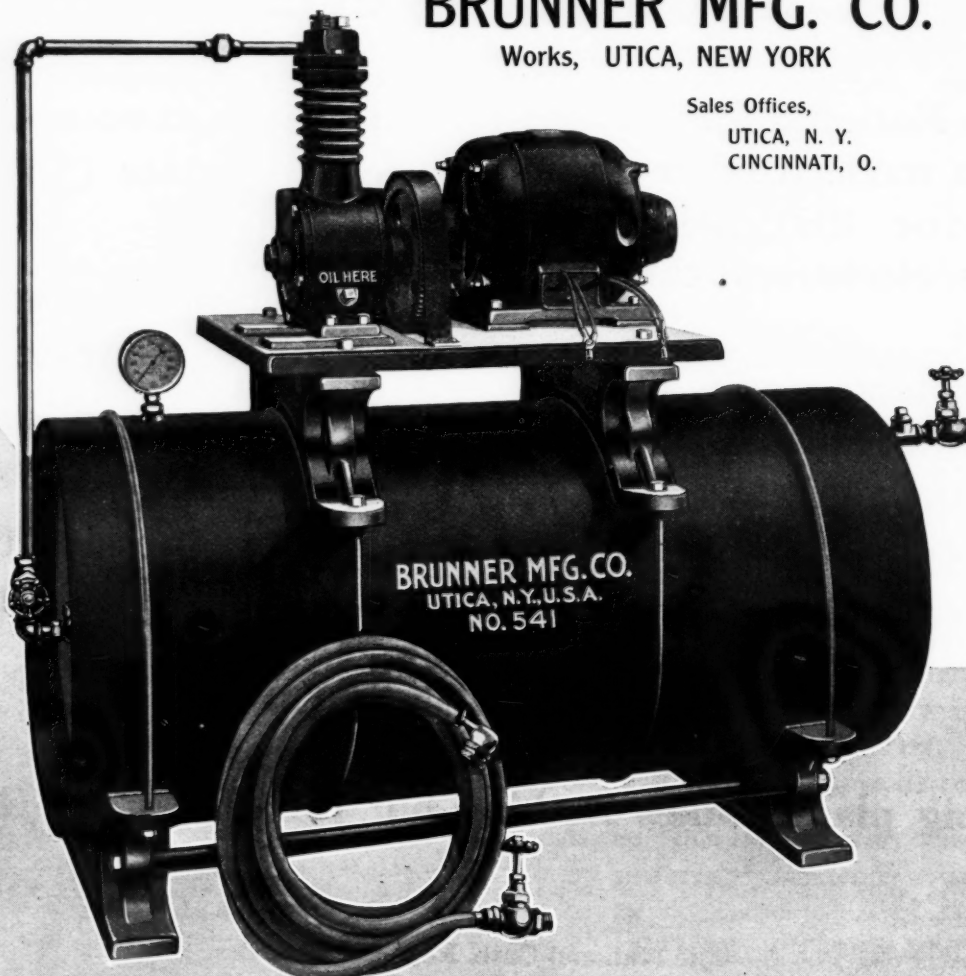
Don't buy any machine until you know it meets your individual conditions. Brunner engineers have probably already designed an outfit to suit your purpose. This information will be valuable to you.

Write for quotations, giving full details and the name of your preferred jobber.

BRUNNER MFG. CO.

Works, UTICA, NEW YORK

Sales Offices,
UTICA, N. Y.
CINCINNATI, O.





SHE'S HITTING ALRIGHT!

The Pulse of the Car!

That's what the COOPER "SPECIAL" CUTOUT has been called.

And the title is a fitting characterization of this exceptional automobile accessory, for it instantly reveals the innermost ailments of any motor. It warns of carbon-clogged pistons—of missing spark plugs—of an over-rich mixture—whether the engine is evenly pulling—in short, like the pulse of the human body, the COOPER "SPECIAL" CUTOUT indicates with uncanny certainty just what is wrong with a faulty motor.

The COOPER "SPECIAL" CUTOUT is sturdily made to resist the ravages of heat and the gnawing tooth of time. It is readily attached by even the most amateurish mechanic. Its operation—aside from its trouble-exposing faculties—blasts out every particle of carbon—thoroughly cleaning the engine and leaving it full of vigor, pep and power.

Sizes	With No. 3 Pedal	With No. 4 Pedal
1½", complete.....	\$2.75	\$3.25
1½-1¾-1⅞", complete	3.25	3.75
2-2½", complete.....	3.75	4.25
2¼-2⅜-2½", complete	4.25	4.50
2⅝", complete.....	5.00	5.50
2¾-2⅞-3", complete..	5.50	5.75

To Dealers: The COOPER "SPECIAL" CUTOUT offers to dealers a quick-selling accessory backed by a nation-wide campaign that brings business in pleasurable volume. An investigation of our dealers' offer will disclose a mighty worth-while proposition. Write today for the details.

COOPER MANUFACTURING COMPANY

DEPT. A, MARSHALLTOWN, IOWA

THE FULTON COMPANY—Sales Managers, Dept. A, Milwaukee, Wisconsin

UNINTERRUPTED TRANSPORTATION



A TRUCK in order to endure and survive the grill of exceptional demands in city or country must be built unusually strong.

The dominating thought in every step of Kissel Truck construction from the selection of material, the testing of the steel and other components, the liberal dimensions and highest grade construction of the frame, axles, springs, brakes, etc. — up to the famous Kissel-built power-plant — is to design all moving and fixed units specially for motor truck requirements.

New devices have been adopted—new features developed—until today Kissel Trucks are accepted as examples of the highest standard.

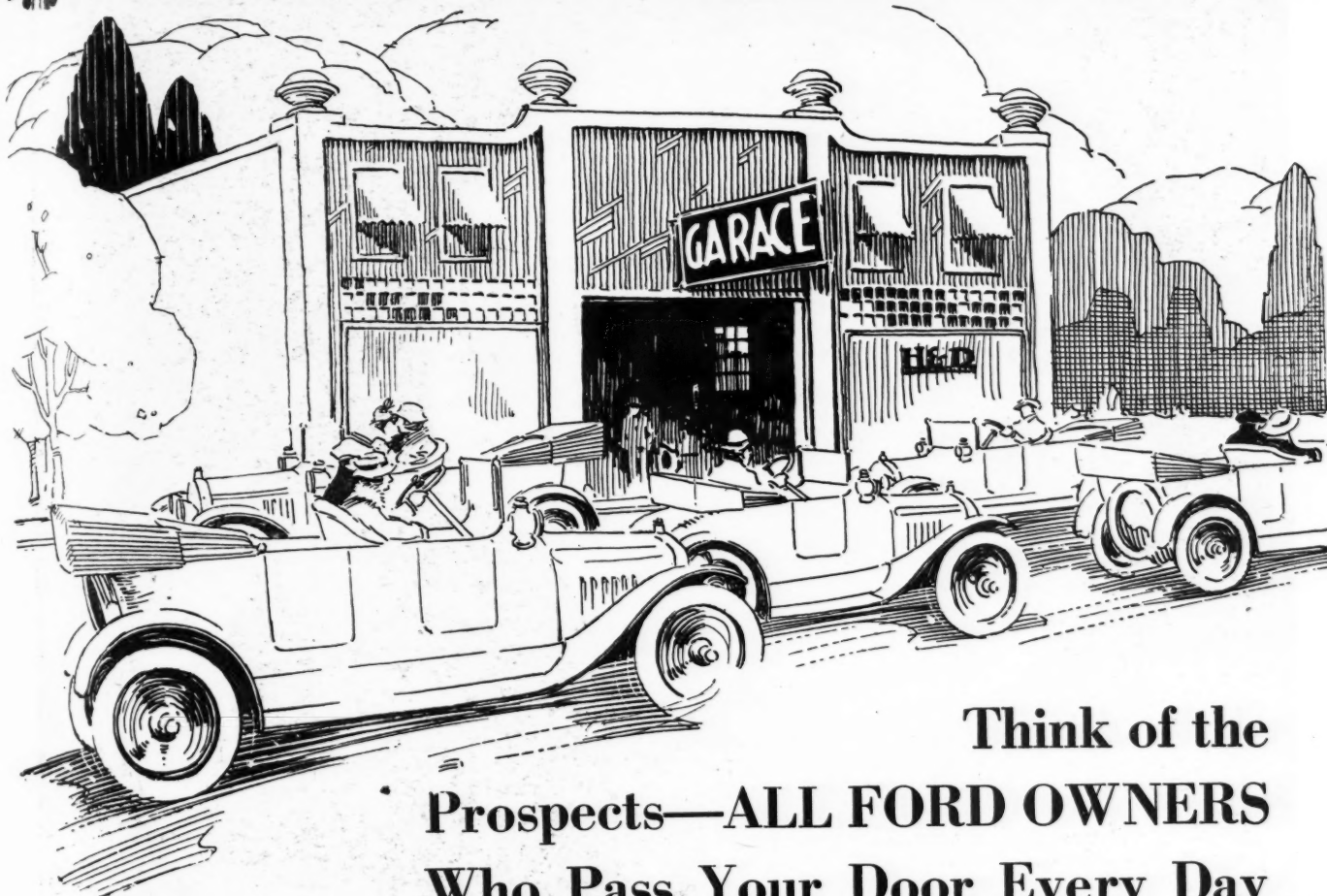
There are five sizes in the line—four of them equipped with the ALL-YEAR Cab.

Kissel Motor Car Co., Hartford, Wisconsin, U. S. A.

KISSEL TRUCKS

When Writing to Advertisers, Please Mention Motor Age

IRON THE ROADS FOR FORDS



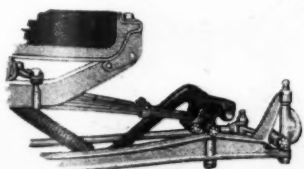
Think of the Prospects—ALL FORD OWNERS Who Pass Your Door Every Day

Bring in New Customers

H. & D. Shock Absorbers have brought new and profitable business to thousands of dealers. Every Ford owner who comes to you for H. & D.'s gives you a chance at **all** his trade. Every set sold creates additional customers. Let H. & D.'s work for you. Order a stock—**now**. If your jobber can't supply you, write us for attractive dealer proposition.

Fully Guaranteed

If, after 30 days, your customer is dissatisfied with H. & D. Shock Absorbers, he may return them and have his money refunded. We will send you a new set and our check for \$3.00 to pay for your trouble.



U. S. Patents—May 8, 1918; April 23, 1918. Letters patent in Canada

It doesn't take much effort to sell a Ford owner a set of H. & D. Shock Absorbers. The average Ford owner will step into a garage and buy without solicitation. Thousands of dealers make a nice profit every year from the mere fact that they have H. & D. Shock Absorbers in stock.

H&D

SHOCK ABSORBERS

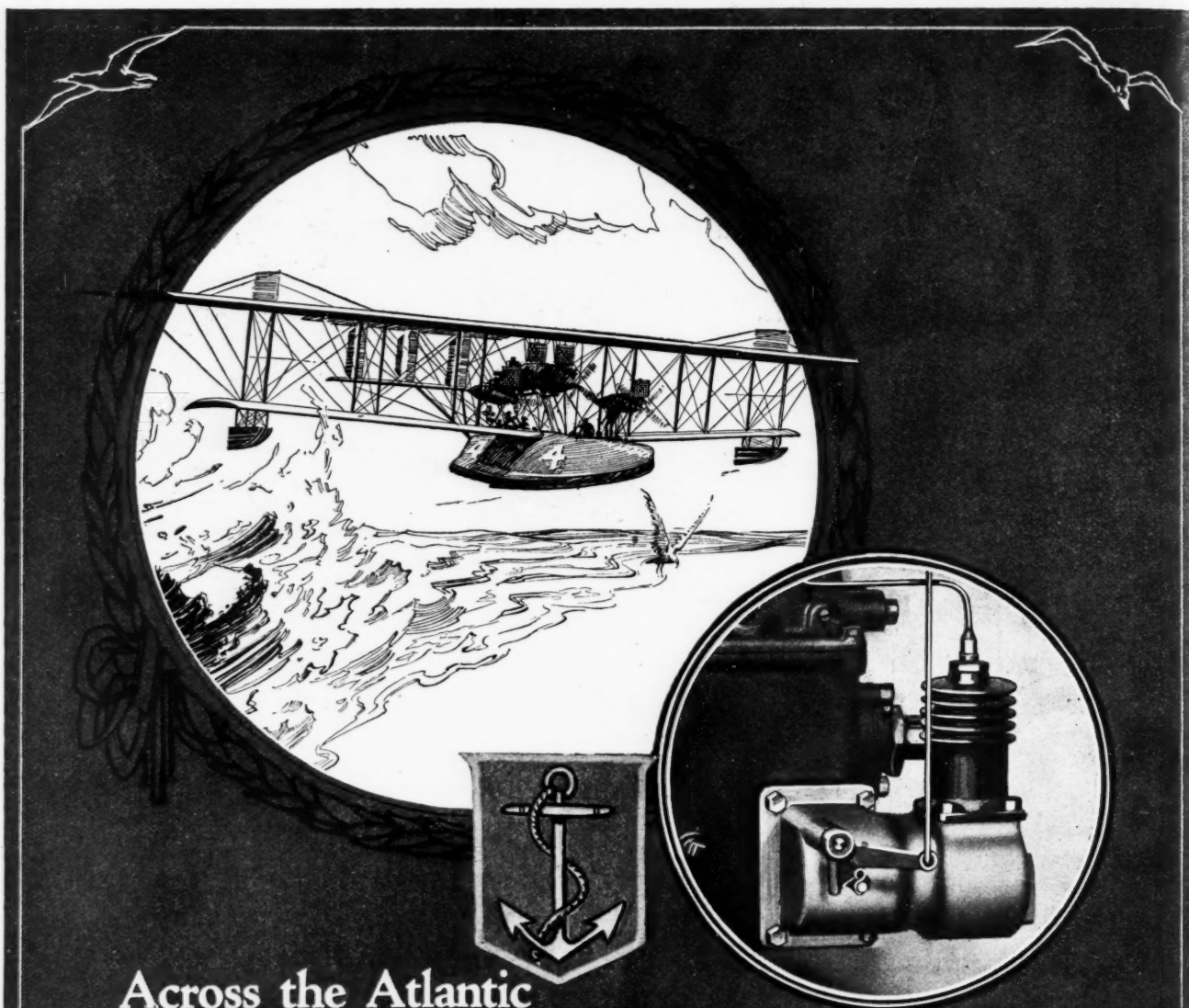
'Single or Twin Arm'

Give a trial order to your jobber. Put the H. & D. trade mark up on your window. It will mean more profits for you, and at the same time give the Ford owners in your territory a device which will put an end to the jarring and discomfort due to bad roads. Fitted to Ford Trucks H. & D. Shock Absorbers give more stability and minimize bumping and breakages. They mean more comfort for drivers—lower delivery costs—more efficient hauling service. They are strongly made with springs of best spring wire steel, and of specially annealed, thoroughly tested metal.

Order from Your Favorite Jobber

H & D Company, Goodland, Ind. In Canada: RICHARDS-WILCOX CANADIAN CO., Ltd. London, Ontario

When Writing to Advertisers, Please Mention Motor Age



Across the Atlantic With the NC-4

That the results of its flight might have some bearing on the future of transatlantic aerial navigation, the NC-4 lacked no safeguards that would increase its chances of success.

The pumps that maintained a constant flow of fuel to all four of its huge Liberty Motors were Kelloggs

—the same pumps that had been tried, proved and adopted by the Navy for use during the war.

This is but another substantial expression of confidence in the mechanical efficiency of Kellogg Products—a faith that has long been voiced by the best engineering opinion of the automotive industries.

KELLOGG MANUFACTURING CO.
ROCHESTER N. Y.

KELLOGG

ENGINE DRIVEN

Tire Pump

Regular equipment on nearly 50 of America's best passenger cars and trucks.

MARATHON

PROTECTION!

Marathon Tires back up the Marathon policy and are the best business protection a dealer can get.

In quality and service Marathons stand head and shoulders above all other tires, and the dealer who handles them finds himself far removed from the business-killing, price-slashing competition that is the "bing" of the tire business. The Marathon dealer builds for himself an enviable reputation that no mere question of price can deprive him of. He has a tire that he can recommend without qualification, and he has behind him a live, aggressive organization willing to co-operate with him in every way possible.

If you cater to a clientele that has been educated to an appreciation of highest quality—maximum service and freedom from inconvenience and possible accident which good tires assure—you will be interested in the Marathon dealers' proposition, for it means not only protection but profit.

THE MARATHON TIRE & RUBBER CO.
Cuyahoga Falls, Ohio

1919 1951

TIRES

The New Allen

Touring Car

(Series 43)

FIVE PASSENGER

\$1295 f. o. b. Columbus, Ohio

As you read this advertisement, several millions will read a two-page announcement of the New Allen in the July 12th issue of the Saturday Evening Post.

If you are already an Allen dealer you know the reception this new car is receiving.

If you are not an Allen dealer you are almost sure to hear of the tremendous stir this car is making.

This Allen is a new type of automobile, "the smaller fine car" — in appearance, beautiful; — in body action, luxuriously comfortable and commodious; — and in performance, the most remarkable actor that has ever appeared in its field.

In cold business terms, the Allen is unquestionably the greatest dealer proposition on today's market.

There is territory still open, but going fast. Write at once, if interested.

The ALLEN MOTOR COMPANY, Columbus, Ohio, U. S. A.



When Writing to Advertisers, Please Mention Motor Age



UNITED Spark Plugs the best seller in the store

If you could see the way the stock of United Spark Plugs turns over.

Truck, tractor and passenger car owners buy United Spark Plugs as soon as they see them.

And United Spark Plugs prove out in actual work.

The "Lockt" terminal provides consistent ignition all the time.

Those buyers tell their friends and that helps make United Spark Plugs the best seller in the store.

There are mighty few complaints about United Spark Plugs—Each plug is guaranteed and stays sold.

And the profit is liberal.

United Spark Plugs will be the best seller in your store, too.

Look in the Chilton Automobile Directory
and Auto Trade Directory for List of
jobbers handling United Spark Plugs.

UNITED MANUFACTURING & DISTRIBUTING CO.
LAKE SHORE DRIVE AND OHIO STREET CHICAGO, ILLINOIS

When Writing to Advertisers, Please Mention Motor Age

Ask your jobber
for the Plug in the
Yellow Checkerboard Box

RETAIL PRICE
Heavy Duty
(for trucks and tractors)
\$1.00

Junior Type
(for Passenger Cars)
75c



*Made for a Purpose
—Consistent Ignition*

Unhampered POWER

Grid-Iron-Grip attachments furnish a steel track for the tractor wheels to ride on. This track is constantly picked up by the wheel after its weight passes over it.

Consequently instead of climbing out of the soft soil—the tractor rides along like a locomotive over it.

This means more power at the draw bar—less fuel—less need to call for reserve power—less strain on gears and other parts—less oil—less vibration—longer

durability—MORE RESULTS.

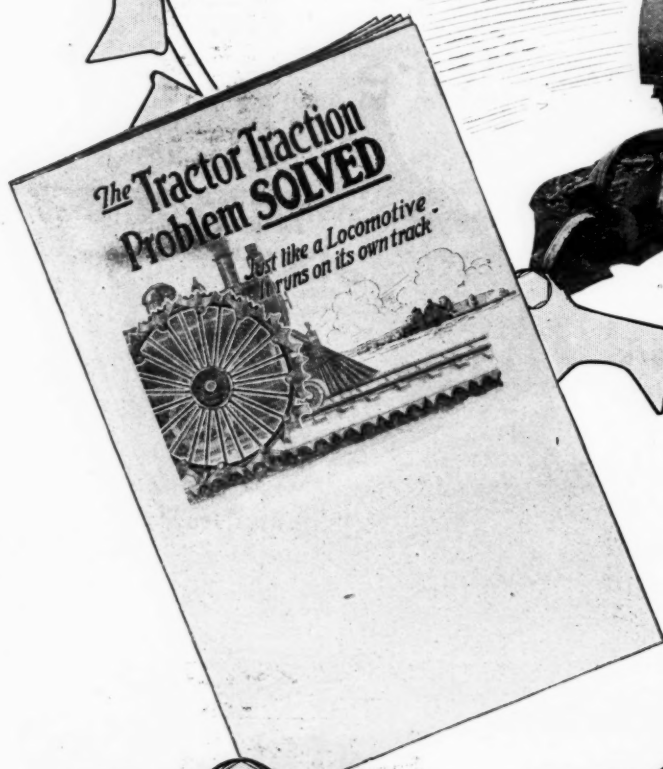
Driving teeth, the action of which is in the tread, make it positively self-cleaning. Easily and quickly attached to any ordinary tractor wheel by a blacksmith.

Farmers, Dealers, Distributors and Manufacturers write for illustrated descriptive matter.

Grid-Iron-Grip Co.

Rock Island

Illinois



**The Tractor Traction
Problem SOLVED**
Just like a Locomotive.
Runs on its own track.

GRID-IRON-GRIP

FOR TRACTOR WHEELS

When Writing to Advertisers Please Mention Motor Age

Strom BEARINGS

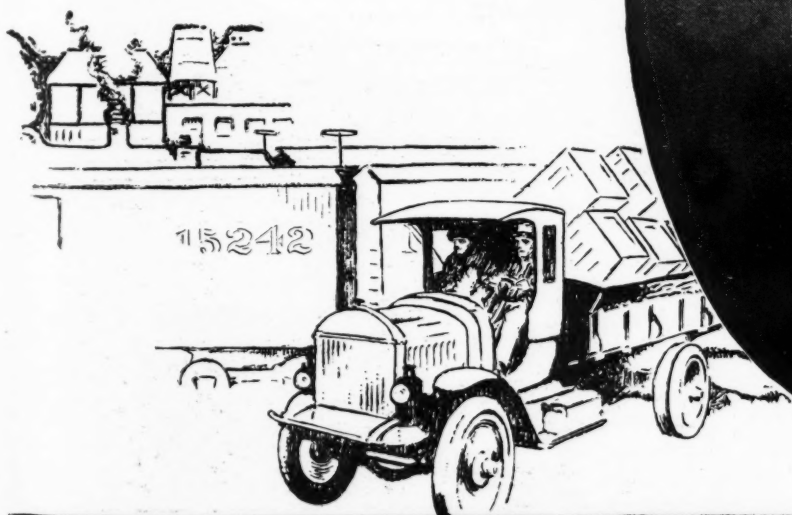
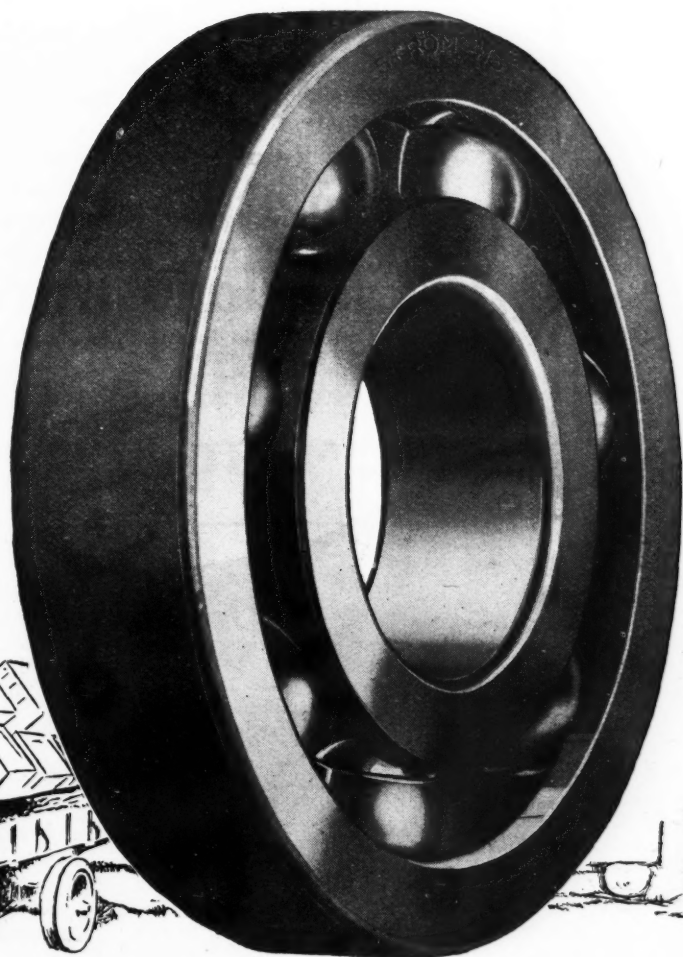
THE efficiency of your machinery depends to a large degree upon the efficiency of your bearing equipment. Strom Bearings reduce operating expense by practically eliminating power destroying friction. They are considered standard equipment wherever a shaft turns.

U. S. Ball Bearing Mfg. Co.

(Conrad Patent Licensee)

Palmer Street and Kolmar Avenue, Chicago, Illinois

(32)



Cletrac

TANK-TYPE TRACTOR

Formerly Known as The Cleveland Tractor

All-Year Use and All-Year Sale

The future of the Cletrac and the Cletrac dealer is not merely "bright"—it is assured.

The Cletrac meets the demand for an *all-purpose farm tractor*.

It does more work and more *kinds* of work.

It works more days in the year.

Besides the farm market, the Cletrac has an immense industrial field.

It has an *all-year sale* as well as *all-year use*.

Send for "Sale Quality in Tractors."

It gives all the details of the Cletrac proposition.

The Cleveland Tractor Co.

19169 Euclid Avenue, Cleveland, Ohio

*Largest Producers of Tank-Type
Tractors in the World*



July 15 We CAN Take On More DEALERS *and* DISTRIBUTORS

Since the first Western Dual Fuel Carburetor was built, we have had more orders than we could fill. We have had more dealers than we could accommodate. Business which came to us unsolicited has kept our factory busy day and night. Since the armistice was signed we have never caught up with the demand, until now.

Increased Production Starts

July 15

An enlarged factory, additional manufacturing facilities and a new foundry will now enable us to supply dealers and distributors with assured deliveries—more carburetors than ever before. We will be able to appoint a number of NEW dealers and distributors. As large expansion is not possible at this time, prompt action is advisable.

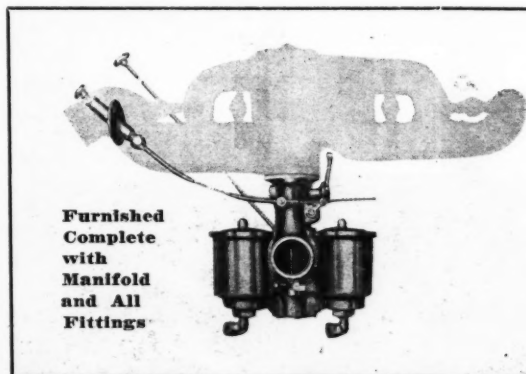
What Some Prominent Users Have to Say:

Hillman's Department Store, Chicago, says:

"In relation to your WESTERN KEROSENE Carburetor, would say that we have been using them in our Hudford cars. They save us at least \$15.00 per month per car in our gasoline expense, or in other words, cut our gasoline expense in two. We have found them easy of operation and believe them to be a thoroughly practical proposition for FORD cars."

The Chicago (Bell) Telephone Co., after making a test, made this statement:

"A 500-mile test with 6 FORDS showed an average fuel cost of \$.0094 per mile with the WESTERN KEROSENE Carburetor. The former equipment under the same test showed an average fuel cost of \$.0255 per mile. This test resulted in equipping the entire fleet (158 FORDS) with the WESTERN KEROSENE Carburetor in Jan. 1918. They are still making good."



Furnished Complete with Manifold and All Fittings

WESTERN DUAL FUEL CARBURETOR FOR FORDS

What the Western Carburetor Is

The WESTERN KEROSENE Carburetor is designed expressly to use kerosene. It also handles gasoline with the efficiency of the highest priced carburetor.

It vaporizes the heavier fuels as well as the lower grades of gasoline perfectly, and more power is developed from these less expensive fuels than from better grades of gasoline.

The fuel, either kerosene or gasoline is thoroughly mixed with air, then changed in the superheater to a dry explosive gas. The heat units in this way are utilized and do not waste themselves in the form of smoke or carbon.

The WESTERN KEROSENE Carburetor is warranted against any and all defects in material and workmanship for a period of one year from date of purchase, and we agree to repair, or replace any parts proving defective within that time, free of charge upon their return, prepaid to our factory.

WESTERN CARBURETOR CO.
ALMA, MICH.

Our Guarantee

We guarantee the WESTERN KEROSENE Carburetor to give you absolute satisfaction. If not satisfactory in every respect, carburetor may be returned within 15 days, full purchase price will be refunded, and carrier charges paid both ways.

Western Carburetor Co.
Alma, Mich.

Gentlemen:

Kindly submit complete data describing your Carburetor and also details of your arrangement for DEALERS and DISTRIBUTORS

Name

Address

When Writing to Advertisers, Please Mention Motor Age

OAKLAND OWNERS HELP CLINCH OAKLAND SALES

Probably no feature of the Oakland Sensible Six is more appreciated than its low cost of operation and maintenance.

In thousands of instances, the economy of this able car has been the sales-clinching point for Oakland dealers.

This argument is especially convincing when it has the confirmation of the unbiased car owner.

And there are more than 100,000 Oakland owners able to testify to the savings they have enjoyed through Oakland Sensible Six ownership.

They regularly report returns of from 18 to 25 miles from the gallon of gasoline, and tire wear that runs from 8,000 to 12,000 miles.

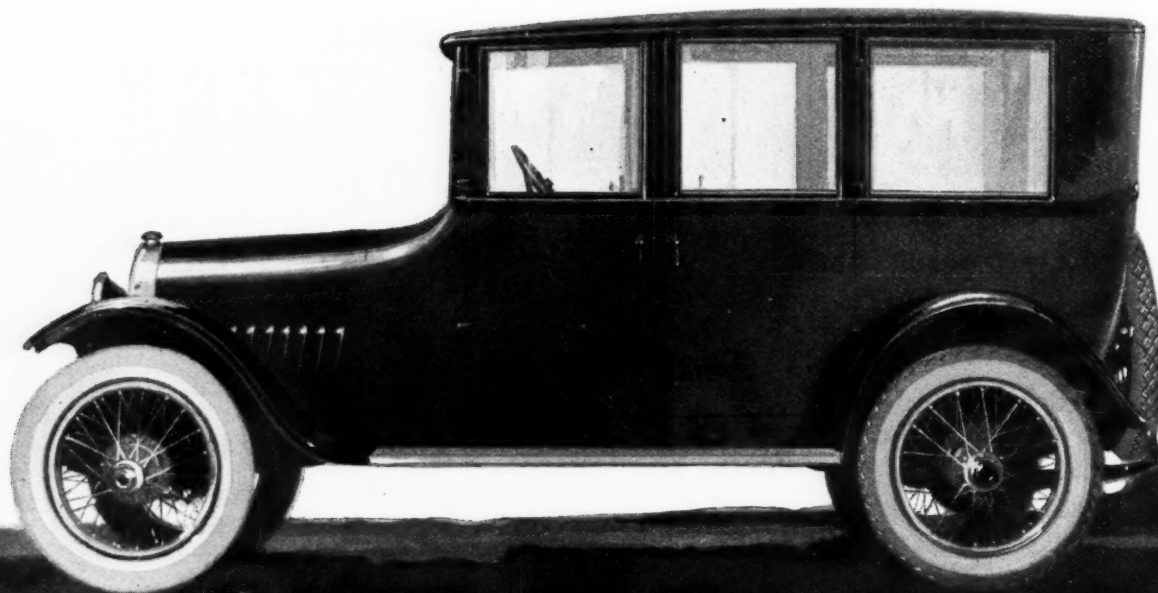
They also have found in the Oakland overhead-valve engine a power for every emergency; and in the chassis, the requisite strength to withstand unusually severe road punishment.

It is no problem to sell automobiles of such popularity and worth. There is still some good Oakland territory open.

The Oakland Sensible Six Four-Door Sedan is a new summer product of the Oakland factories that is proving a sales-stimulating attraction wherever it is displayed. Like other Oakland models, this new sedan is moderately priced, light in weight, and sparing of gasoline and tires.

OAKLAND MOTOR CAR CO., Pontiac, Mich.

Touring Car, \$1075; Roadster, \$1075; Coupé, \$1650; New Four-Door Sedan, \$1740
F. O. B. Pontiac, Mich. Additional for Wire Wheel Equipment, \$75.00



OAKLAND

SENSIBLE SIX

When Writing to Advertisers, Please Mention Motor Age

SAFETY Impulse Starter

"FOR TRUCKS AND TRACTORS"



Fits any Type of Magneto

THE necessity for a device of this character is obvious. Yet only a few magneto makers have made it a part of design. Even these starters are not interchangeable. They only function on the magnetos for which they were designed.

The Safety Impulse Starter can be installed in an hour upon any magneto. It reduces the work of cranking the light or heavy truck or tractor engine to approximately one quarter turn of the crank.

We note here the "different and better" points of this compact, simplified impulse starter. Read them.

Truck and tractor designers will find in the Safety Impulse Starter an efficiency item that will appeal to the careful buyer—one that will materially lessen the selling resistance of their products. Send for details. Retail price \$10, including universal fitting coupling, complete, ready to install.

*Dealers—Garagemen—Repairmen—*You will find ready sale for the "Safety." Truck and tractor owners will see and appreciate its many service features. Write for our liberal proposition.

Jobbers. Investigate. A big new field, tremendous in its possibilities, is now open for you and our proposition is one that will appeal to you.

SAFETY IMPULSE STARTER CO.

325 NORTH 15th STREET

PHILADELPHIA, PA.

Do You Know The Difference in Impulse Starters?

The made-for-a-certain magneto type will fit no other magneto.

The "SAFETY IMPULSE STARTER" with its Perfected universal fitting coupling will fit any magneto and can be installed in one hour's time.

The ordinary starter is a delicately made, complicated device having as high as 40 parts.

The SAFETY IMPULSE STARTER is a compact, sturdy affair with but 10 parts and only 6 of these moving ones. It can be depended upon to outwear and outlast the magneto with which it is used.

When the spring in the made-for-one magneto starter breaks it interferes with the timing and causes expensive repairs and delay.

The Spring of the "Safety" is strongly housed. Should it break, interference with magneto action or timing is completely impossible, thanks to our patented construction.

The ordinary Impulse Starter gives no protection against back firing—a dangerous proposition with a powerful engine.

The SAFETY IMPULSE STARTER prevents back firing—makes it completely impossible. This one feature alone is well worth the cost of the starter.

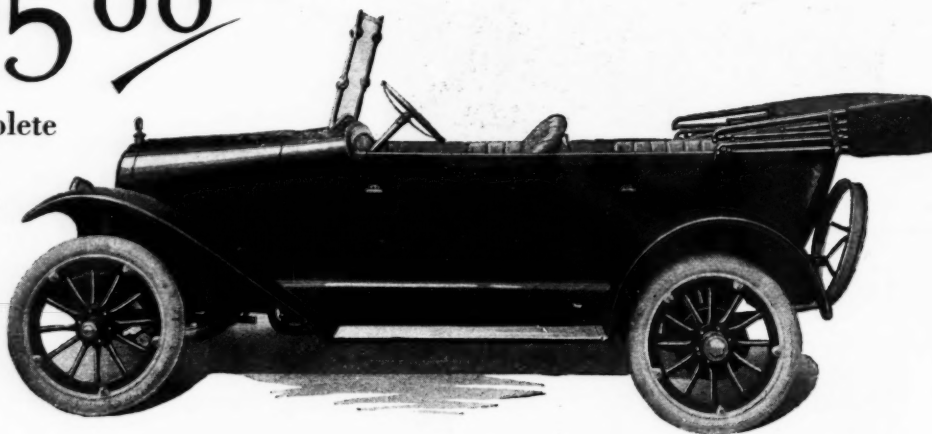
The Truck and Tractor Cranking Problem Solved!



Moore Merchandizing Means More Profits

\$895.00

Including Complete
Equipment
f. o. b. Danville, Ill.



MOORE dealers—merchandising MOORE cars—meet with less sales resistance and more spontaneous active response, than dealers for almost any other passenger car this year.

Consider the tendency of prospective automobile purchasers today. They want the best car they can get at a moderate price.

MOORE cars sell for \$895.00. They are made up of units than which there are none better available in their class. MOORE cars give more and cost less to keep in service than others cars selling at the same price.

Immediate and always increasing success on the part of dealers, proves that MOORE merchandising makes more profits for dealers who sell MOORE cars.

Your territory may be open. If it is you should know "The World's Greatest Little Automobile."

Wire or write for complete dealer information today.

MOORE MOTOR VEHICLE COMPANY—Danville, Illinois



How to Judge Advertising Claims

MILEAGE is the test of advertising claims. You want tires to sell that can back up the claims made for them with a performance which shows on the dashboard.

In selecting a line to handle, experience teaches you to look behind the selling points for miles. You have learned that the way to sell a man a tire *twice* is to give him big mileage the first time.

Right here is the secret of the success of J & D Dealers. Their tires not only give exceptional mileage performances—but they do it every time. They are built to create resales by making motorists feel they can be depended on for long mileage.

If J & D Tires are not represented in your territory write for full details of our exclusive sales proposition.

J & D TIRE COMPANY

Charlotte,

North Carolina

San Francisco: 895 Post Street

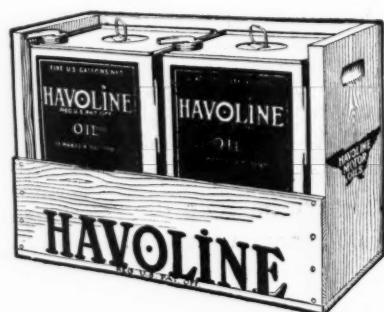
BETTER
MADE
FOR
BETTER
TRADE

J&D TIRES

THE MORE
THAN
6000
MILE
TIRE

When Writing to Advertisers, Please Mention Motor Age

Selling Oil



IN a series of advertisements in *The Saturday Evening Post*, *The Literary Digest*, and state farm papers, Havoline Oil is telling owners how to get real service out of their passenger cars, trucks and tractors. Here is your chance to sell more oil, particularly to Mr. Farmer.

Note the selling point made. Inside of cylinders, where hot explosions may raise the heat between pistons and cylinder walls to 400 degrees Fahrenheit, other oils sometimes disintegrate, but that excessive heat can't make Havoline Oil break up. That's the big Havoline selling point—in all conditions, it keeps on lubricating perfectly, it does not break up.

Don't wait for Mr. Farmer to come to you to buy a few cans of Havoline Oil. Drive out and sell him a half-barrel or a barrel. Talk over the interesting points raised in this advertising. Use this special Havoline selling point.

You will be surprised at the number of extra barrels of Havoline Oil you will sell by going to Mr. Farmer, instead of waiting for him to come to you.

Other dealers are selling much more Havoline to Mr. Farmer in this way. Why don't you try it?

INDIAN REFINING COMPANY, NEW YORK

Incorporated

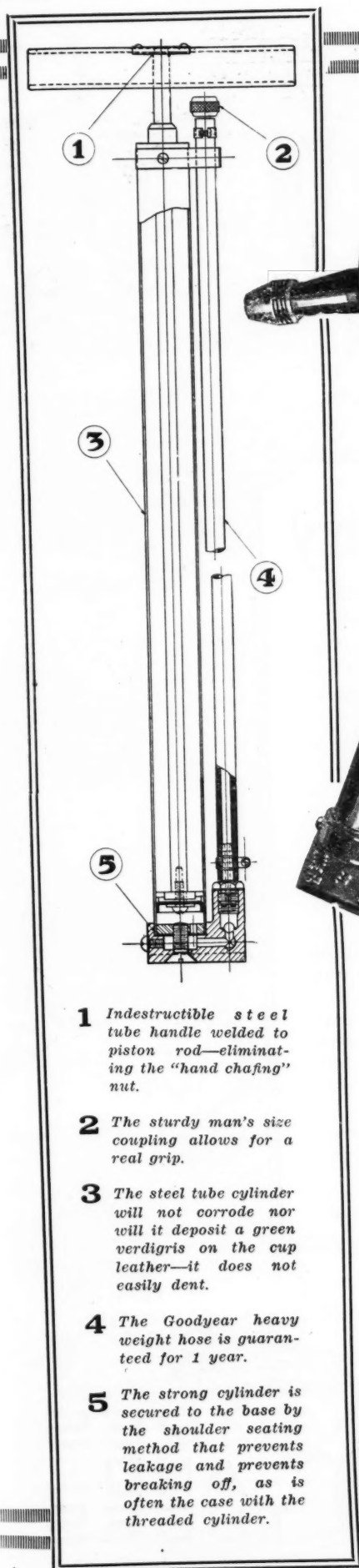
Producers and Refiners of Petroleum

HAVOLINE OIL

REG. U.S. PAT. OFF.

"It makes a difference"

COPYRIGHT



- 1 Indestructible steel tube handle welded to piston rod—eliminating the "hand chafing" nut.
- 2 The sturdy man's size coupling allows for a real grip.
- 3 The steel tube cylinder will not corrode nor will it deposit a green verdigris on the cup leather—it does not easily dent.
- 4 The Goodyear heavy weight hose is guaranteed for 1 year.
- 5 The strong cylinder is secured to the base by the shoulder seating method that prevents leakage and prevents breaking off, as is often the case with the threaded cylinder.



These 5 Exclusive Points Sell the Wayne

They make this pump the best on the market—the easiest selling pump you ever stocked. Its performance will back up anything you say for it.

There's years of satisfactory service in the Wayne Pump. Its construction is simple—it is strong—durable and easily cleaned. It finishes the pumping job in a jiffy.

WAYNE TYPE B PUMP

It is the kind of a pump your customers want. A man can get a big fisted grip on the handle—that fits the hand. The sturdy piston rod will not bend under severe service, it is always in alignment. The big, broad base will keep the pump erect when standing alone.

Dealers who believe in building goodwill by selling quality accessories display the Wayne Type B Pump. It is a pump that they can absolutely guarantee to their customers. And every sale means a good profit.

Write your jobber about Wayne Pumps.

WAYNE ENGINEERING CO.

Honesdale

Penna.

5000 MILE

GUARANTEE



Town or Country

**Good Tires at Low Prices
Mean Permanent Customers**

The first reason for becoming our dealer: Kokomo tires do give **SATISFACTION**—one sale means repeat sales to the same purchaser.

The second reason: You can supply even odd sizes of tires immediately from stock.

Third: There is a Kokomo tire and tube for any motor propelled vehicle that requires tire equipment at prices to suit your customers.

You dealers make a good margin of profit on Kokomo tire sales. We will continue to keep your sales growing by maintaining the quality of the product, even at the low selling prices. The satisfactory experience you and your customers will enjoy with Kokomo will be profitable to both of you. Remember, we will pay for local billboard posting and newspaper advertising and furnish all the billboards and advertisements, with your own name imprinted on them.

Are you the Kokomo dealer in your town?

KOKOMO RUBBER COMPANY

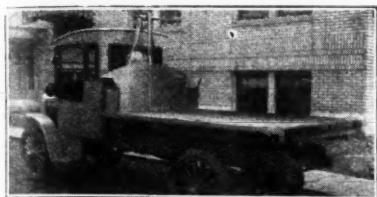
"A Quarter Century of Leadership"

Kokomo, Indiana

LONG-LIFE
Kokomo
TIRES AND TUBES
5000 MILE GUARANTEE

DAILEY BODIES

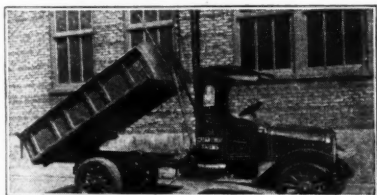
Dailey 4-in-1 Bodies and Auto Truck Steel Bodies Help Dealers INCREASE Sales and Profits



PLATFORM BODY—For hauling bulky loads such as bagged cement, waste paper, light rubbish, pasteboard boxes, etc.



EXPRESS BODY—This type of body is best suited for carrying lump coal, trunks, packages, groceries, meat, and odd loads.



DUMP BODY—Such loads as crushed stone, sand, gravel, fine coal, cinders, etc., are conveniently hauled and dumped by Dailey Bodies and Hand Hoist.



STAKE BODY—Is very useful. It can be most profitably employed in hauling barrels, boxes, furniture, lumber, pipe lengths, etc.

Dailey 4-in-1 Bodies make trucks easier to sell—they equip one truck to do the work of four and no added investment is required.

Dailey 4-in-1 Bodies and hand hoist cost about the same as a one-purpose standard body, or much less if bought in split units—and they carry an unrestricted guarantee for one year.

With a Dailey 4-in-1 Body and hand hoist on it any truck is easier to sell and the profit on each Dailey Body is good.

Get a Dailey 4-in-1 Body for demonstration purposes—sales are then easily and quickly made.

Auto Truck Steel Bodies

are made for hard, relentless service.

The prompt delivery of a truck body is often the deciding factor in closing a truck sale.

We always have on hand a large stock of standard bodies shown here and can make immediate shipments.

Or, we can build a body for you, no matter how new or complicated the type—and do it in record breaking time.

Write, wire or phone your requirements—our service will prove a money maker for you.

H. R. DAILEY, U.S. Sales Agent
AUTO TRUCK STEEL BODY CO.

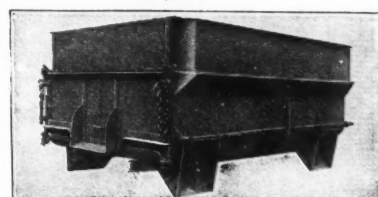
3028 Carroll Ave.

Chicago

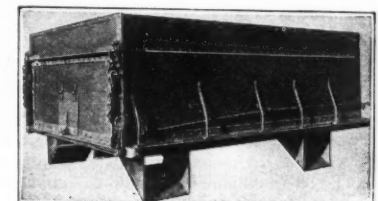
Dailey 4-in-1 Bodies are made by

Simplex Mfg. Co.

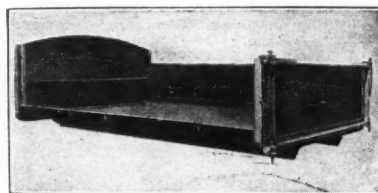
Conneautville, Pa.



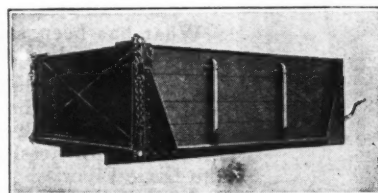
Model A—Standard body, with chutes on side, removable sideboards, double-acting tailgate, with chain, small door and chute in rear.



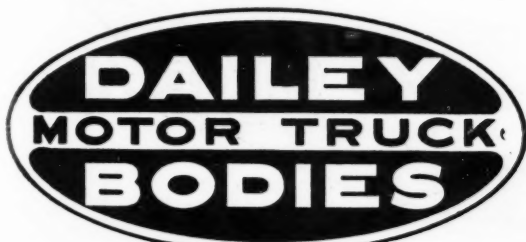
Model A-5—Standard body, hinged sideboards, chutes on side, double-acting tailgate with chain, small door in rear.



Model A-3—Standard platform body with double-acting tailgate, removable steel sideboards, 2" radius at bottom (square if preferred).



Model A-2—Standard platform body with double-acting tailgate, removable wood sideboards.



CHICAGO

DISTRIBUTORS For Steel and Wood Bodies:

AUTO HOIST & BODY COMPANY,
18 Bainbridge Street, Brooklyn, N. Y.

TRUCK ENGINEERING CO., 3533
Cedar Avenue, Cleveland, Ohio.

SIMPLEX BODY CO., 140 Rhode Island
Street, Buffalo, N. Y.

THE JOHN IMMEL & SONS CO.,
Columbus, Ohio.

HYDRAULIC HOIST MFG. CO., 715
Lorraine Avenue, Detroit, Mich.

AUTO HOIST & BODY CO., 333 Ave-
nue B, New York City, N. Y.

TROY TRAILER CO., 5 N. 21st Street,
Philadelphia, Pa.

THOMAS & COMPANY, Braddock
Avenue, near Forbes Street, Pittsburgh,
Pa.

AUTO TRUCK STEEL & WOOD BODY
CO., Frisco Bldg., St. Louis, Mo.

SIMPLEX MFG. CO., Conneautville, Pa.

When Writing to Advertisers, Please Mention Motor Age



ALUMINITE
Connecting
Rods

ALUMINITE PISTONS

ALUMINITE PISTONS

ALUMINITE Pistons are *more* than aluminum pistons. Strong enough to withstand all strains. Hard enough to give good bearing surfaces. Light enough to insure valuable fuel saving.

At overhauling time have ALUMINITE Pistons installed by your repairman. Cost you less in the long run. DEALERS and REPAIRMEN profit by the ALUMINITE line.

ALUMINITE CONNECTING RODS

ALUMINITE Connecting Rods increase the efficiency of ALUMINITE Pistons. Give the motor greater power and speed. Decrease vibration and gasoline consumption. ALUMINITE Equipment is most efficient when complete.

GREEN POWER PLUS Cylinder Heads

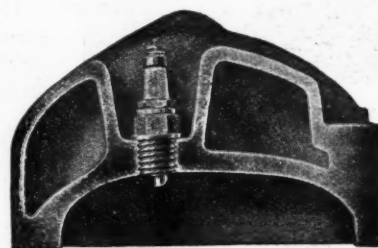
Price \$25

Sold on 30-Day Trial
Gives additional water space around the spark plug, gained by locating the plug directly over the center line of your cylinder. The result is additional power and pull for FORD PASSENGER CARS and TRUCKS

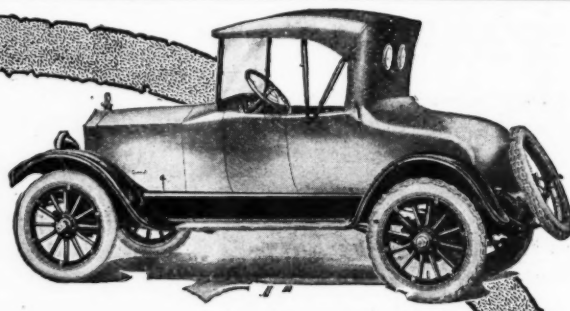
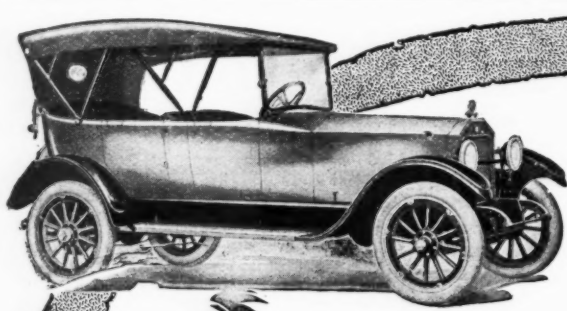
WRITE

GREEN ENGINEERING CO.

34 South St. Clair Street, Dayton, Ohio



Green Power Plus Cylinder Head



The Car, the Company and the Dealer

What has been said of many higher priced cars can be truly claimed for the Dixie.

Beauty, poise, dignity—the things that appeal to the eye—the ability to take you there and bring you back—which contributes mostly to pride of ownership—all are conspicuous in the Dixie Flyer.

And the same breadth of vision employed

in the manufacture of the Dixie is reflected in the generous cooperation and permanent protection this forty-year-old company accords its distributors everywhere.

The live dealer who appreciates the sales possibilities of the Dixie Flyer—who values the spirit of Dixie cooperation—will find in this car and this company his larger opportunity.

Wire for Particulars

KENTUCKY WAGON MFG. CO., INCORPORATED, THIRD AND G STREETS, LOUISVILLE, KY.

The **DIXIE** Flyer

The **DIXIE** Flyer

When Writing to Advertisers, Please Mention Motor Age

HOLT
PEORIA-STOCKTON

HOLT
PEORIA-STOCKTON











“THE RETURN of the CATERPILLAR”

The “Caterpillar” tractor is once more available for agriculture and industrial use. *Before* the war the “Caterpillar gave agricultural and industrial users dependable and economical service. The Allied and U. S. Armies chose the “Caterpillar” as the Artillery and Supply tractor during the war when any failure would have meant disaster. The “Caterpillar” *made good* and won the enthusiastic endorsement of the world’s greatest Army Engineers. Now, *after* the war you can obtain this same tractor with the refinements that have come from military service,—and many years of farm and road work in many countries.

The “Caterpillar will plow the softest land, the stiffest clay or the most stubborn sod; it will pull logs through the forest trails and transport heavy loads of ore over steep mountain grades and across wide stretches of desert; it is also fitted for the building and maintaining of roads and highways and for all work demanding a tractor of power and endurance.

Its self laying steel tracks give positive traction everywhere.

Our new models, 5 and 10-ton (ordnance types) will be shown at all National Tractor demonstrations. A “Caterpillar” agency obtained now assures a permanent and profitable business for dealer or distributor. Inquiries invited regarding available territory.

There is but one “CATERPILLAR”—Holt builds it.

THE HOLT MANUFACTURING COMPANY, Inc.
FACTORIES, PEORIA, ILL.

NEW YORK OFFICE
50 Church St.

STOCKTON, CALIFORNIA



“CATERPILLAR”

TRACTORS

There's a Reason Why Big Dealers Sell

JUMBO
MOTOR TRUCKS

THE Jumbo agency enables dealers to dominate the truck field, and build a profitable substantial business. Jumbo Trucks are honestly built and have established a reputation throughout the country. They must be honestly sold by dealers—without misleading statements or false claims of any kind.

This sales policy means satisfied owners—confidence in Jumbo Trucks and Jumbo dealers—it means greater sales and more repeat business—it is the keynote to success.

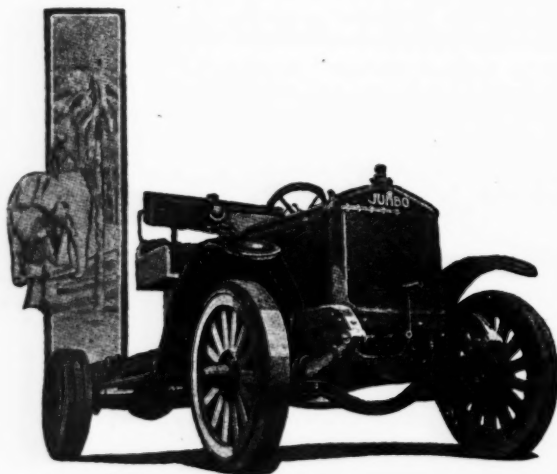
If you are the type of dealer who wants to build a dominating business—if you appreciate honest value, *real* sales co-operation and a truck so well built that it easily outsells competition, investigate the Jumbo agency today.

Write for all facts and dealer offer.

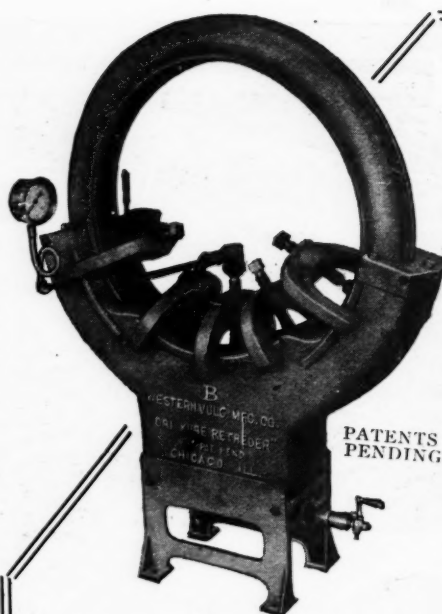
Full line of sizes.

Nelson Motor Truck Company
Saginaw - - - Michigan

JOHN SIMMONS COMPANY
102-110 Center St., New York City
Eastern Distributors and Export Representatives



A Full Line of Sizes



Is
your
shop
ready?
Have
you

the proper equipment?

From all over the country come reports of a greater demand for retreading than has ever before been known.

The shops which are using the

DRI-KURE RETREDER

are the leading tire shops everywhere. The Dri-Kure Retreder is the **only** retreading equipment that is fundamentally **right** all the way through.

Each job is complete when it leaves the mold—no “finishing” is necessary.

The Dri-Kure Retreder—

- Eliminates “Come Backs.”
- Makes “finishing” unnecessary.
- Does better work quicker.
- Makes satisfied customers.
- Assures more profits.

Be the first shop in your community to install the Dri-Kure Retreder.

Be the leader in your field and make every customer your friend.

Your work will stand up.

Write today for catalogue

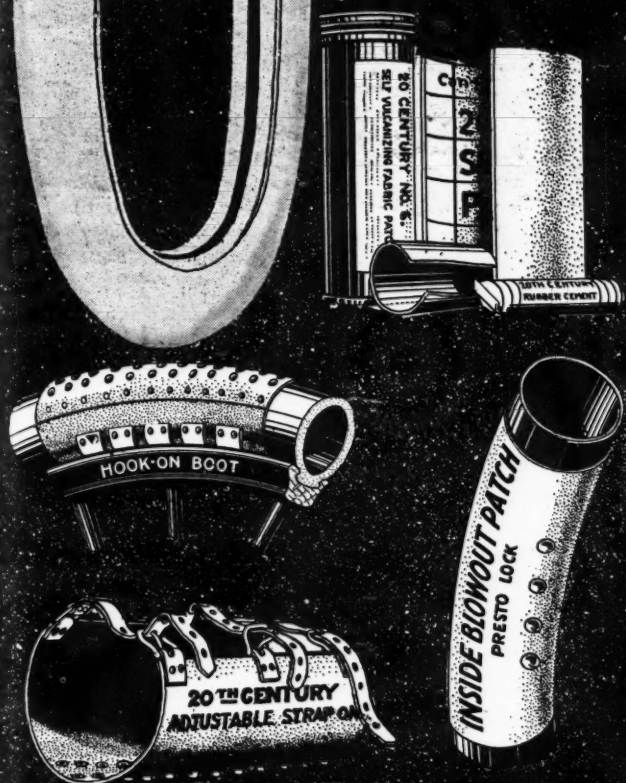
Western Vulcanizer Mfg. Co.

Manufacturers of Dri-Kure Retreders, Sectional Moulds, Tube Plates and other Vulcanizing Equipment

150 N. Desplaines St.

CHICAGO

20th Century Tire Accessories



ADD MANY DOLLARS TO YOUR PROFITS

The quickest and easiest selling lines are profitable and if they give car and truck owners solid satisfaction—you are building trade for tomorrow. And that's what counts in these days of keen dealer competition. Stock the 20th Century line of tire accessories. Not only are they **wanted** by every car and truck owner—but they are efficient, dependable, attractively priced and need only your recommendation to sell them.

DEALERS

Right now is the time when your customers and passing drivers are most likely to ask you for such accessories. If your jobber doesn't stock 20th Century tire accessories write for our very attractive dealer proposition today. Don't delay.

JOBBERS

Your experience tells you that the 20th Century Tire Accessory line fills an absolute need. Not only is the quality right—but it is worth while pushing this profitable line.

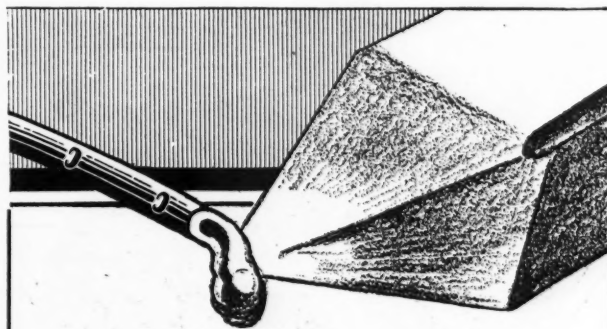
20th Century Tire

Midlothian



Protector Co.

Texas



Simplified Soldering

Make your soldering jobs easier and save time and money by using KESTER SELF-FLUXING WIRE SOLDER. It is a wire solder with a core made up of a series of pockets full of flux. As the solder is melted, one after another of the pockets is opened, allowing just the right amount of flux to flow to the job. Hard-to-get-at jobs are made easy and soldering of all kinds is simplified. Use on radiators, spark plug connections, battery terminals, tanks and wherever a lasting bond is needed. Sold by automobile accessory dealers in one-pound coils in cartons, and on one, five and ten-pound spools.

Write for Free Sample

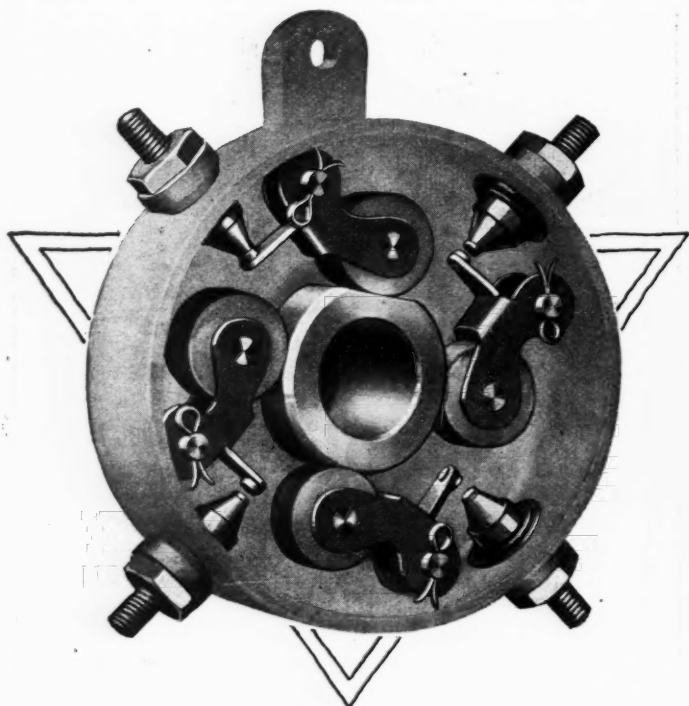
Write us for a liberal sample. Try it out on your own work without cost—see how much time and money it can save you. We will gladly send you a big free sample.

CHICAGO SOLDER CO.

218 N. Union Ave.,

Chicago, Ill.





DUNTLEY MAGNETO BREAK TIMER

FOR ALL FORD CARS

Overcomes Every Timer Trouble

This timer is designed and built so it can't go wrong. Mechanically, it is as near perfection as an article of this kind can be made.

Its fiber rollers, in addition to their superior wearing qualities, eliminate the necessity for oil. They are a feature with which all timers should be equipped.

There are no sliding contacts to become insulated with oil; the positive contact overcomes starting troubles; the tungsten points will not pit or burn; positive timing on all cylinders; interchangeable on regular Ford fittings. Tests show remarkable savings in fuel.

FOR FORDSON TRACTORS

The following letter tells the experience of a Fordson Tractor owner, who uses a Duntley Magneto Break Timer.

"The timer you sent is all you claim for it. It certainly gives the tractor twice the power it had before and also is a saver of fuel." Name on request.

**SOLD ON AN ABSOLUTE
MONEY BACK GUARANTEE**

Dealers—Write for our sales proposition

JACK DUNTLEY

1004 Michigan Ave.

CHICAGO, U. S.



50% More Sales

The sales of Acme Trucks have increased 50% over last year. Buyers recognize the superior construction of Acme—they know its remarkable proved standards of service, and enterprising Acme distributors and dealers are reaping the benefit. Acme builds for permanent sales. Dealers take on no service burden when they sell Acme trucks. They know that in Acme they have the best built truck in the world, for Acme, without consideration of cost, adopted such proved units of construction as Continental Motor; Timken bearings, axles and drive; Borg and Beck clutch; Cotta jaw clutch transmission; heat treated pressed steel frame.

Built in 1—2—3½ and 5-ton models.

Bodies built in Acme Factories.

Dealers who want to get in on the rising tide of Acme sales will get our proposition without delay. There are opportunities for dealers still open in desirable territory. Get in touch with us now. Ask for our book, "Pointers to Profits."

Acme Motor Truck Co.

133 Mitchell Street, Cadillac, Michigan

The Seal of
Dependable Service

Trademark
Reg. U. S. Pat. Off.



When Writing to Advertisers, Please Mention Motor Age

The Salisbury New Rear Axle

Standard
Type
Pressed
Steel



**"Always
Safe"**

AN automobile is only as good as its rear axle. Remember — you may have the best engine in the world in your car but that does not and cannot make it a good motor car unless the rear axle is mechanically correct and physically perfect.

Few people realize that the rear axle of an automobile is, next to the engine, the most important mechanical factor in producing a good automobile. The engine's power is transmitted to the rear (driving) wheels through the pinion gear of the propeller shaft and differential mechanism—all part of the rear axle. The rear axle of a carriage or wagon carries the weight of the vehicle on the spindle. The rear axle of an automobile carries the weight of the vehicle on its housing—the pressed steel case which encloses the differential gear, driving shaft and all bearings—and includes the wheel hubs, brakes and brake mechanism complete ready for use. One may better understand the importance of the rear axle when it is said there are over 150 individual parts of the rear axle mechanism that must be carefully machined and fitted to micrometer measure. This mechanism must be compact, silent and of great strength to transmit the power of the engine to the driving wheels with the least possible friction or loss of power.

The Salisbury New Pressed Steel Rear Axle is produced in our two big plants after 15 years' successful building of front and rear automobile axles, complete with hubs and brakes for the trade. It combines the great strength and durability of our own special formulae steel with simplicity of construction.

Made in three standard sizes for cars weighing 1700 to 4000 pounds.

The manufacturer who specifies our axles adds a strong selling point to the prospective purchaser.

SALISBURY AXLE COMPANY
Established 1902



Jamestown, N. Y., U. S. A.

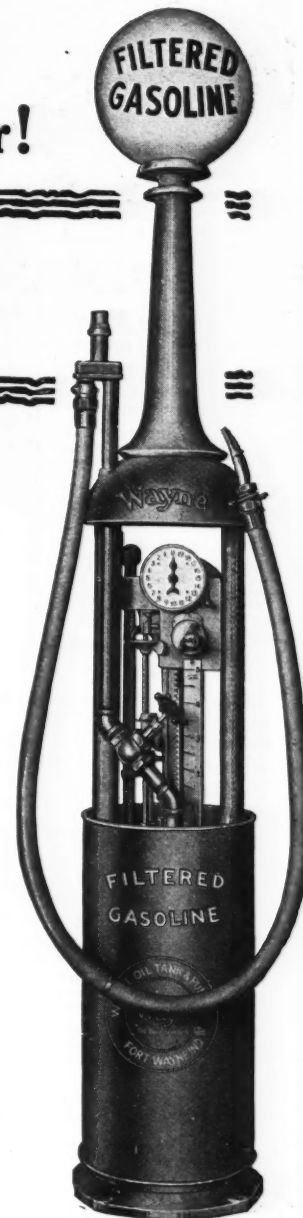
PERU AXLE COMPANY
Established 1909



Peru, Ind., U. S. A.

Install This Trade Builder!

A Wayne Cut 276 Curb
Gasoline Curb Pump



Cut 276

is a magnet that will draw to your store cars of the better class—a clientele that will add distinction and prestige to your business.

Motorists purchase gasoline with greater care these days and they are quick to recognize the Wayne as a device that assures clean, pure fuel.

This Wayne Cut 276 is a pump that creates a favorable impression by its speedy action, its accurate measure and its visible checking clock-like dial.

Built of the best materials and by skilled mechanics. This is but one of many designs made by us for the storage and handling of oils, gasoline and other liquids.

Write for Bulletin 276 MA covering this model

A Pump for Every Requirement

Wayne Oil Tank and Pump Co.

518 Canal Street

Ft. Wayne, Ind.

MASTER
PUMP
BUILDERS
FOR
26 YEARS

ATTRACTIVE PRICES
ATTRACTIVE PUMPS

Save

TIRES LIKE THESE



**I Earned
\$2200
In Four
Months**

This is Richard A. Oldham, telegraph operator for the Illinois Central Railroad for twenty years. He is fifty-eight years old. One day he read one of my advertisements and the possibilities of making money in the Auto Tire Surgery Business. In a few weeks he had purchased and installed a Haywood outfit. A short time afterward he wrote us that his income in four months was as much as it had been in 2½ years as telegraph operator.

**Be
a Tire
Surgeon**

**MAKE \$2,500 TO
\$4,000 PER YEAR
GIVING NEW LIFE
TO OLD TIRES**

It is being done—by the wonderful new Haywood method of Tire Surgery. It is one of the great results of the war. A Haywood Tire Surgeon can do more with old tires than was even dreamed of before the war. By the Haywood Method a Haywood

Tire Surgeon can give 4,000 to 5,000 more miles of new life to a tire, that two years ago would have been thrown on the junk pile. As a surgeon saves human lives by his operations, so by Haywood Tire Surgery, you can save and lengthen the life of old tires. And it's easy to learn.

HAYWOOD'S TIRE SURGERY

Stations Are Needed Everywhere

20,000,000 tires wearing down every day. By Tire Surgery, you can quickly repair, rebuild and give new life to tires seemingly all worn out. Cuts, gashes, tears, bruises, broken fabrics, every kind of an accident that can happen to any tire, inside or out, you can repair and save for long service. The chance to make money is simply wonderful.

\$2,500 to \$4,000 A YEAR is possible

During the war the nation needed an unusual service to keep the thousands of automobiles, ambulances and aeroplanes going day and night. Haywood Tire Surgery met the demand.

If we told you all the truth you wouldn't believe it. You would say, "It is too good to be true." But you can see what a great field there is for Haywood Tire Surgery Stations—for this better way. You have eyes. You see why there must be wonderful chances to make money. But to see—to know is not enough.

It is action—decision—that counts in these days. The man who waits, gets lost in the shuffle. It is the resolute will to follow your hunch that lands you where the money is.

Send Today for My Free Book

I have ready to mail you the day I get your request, a fascinating book—all about tires—how to repair them by the Haywood Method—how to start in business—how to build up trade—what to charge. You needn't write a letter—just tear out the coupon right now, fill it in and mail. In 48 to 72 hours you can have the whole proposition right in front of you. It's a case of walking right into \$2500 to \$4000 a year and up. Use coupon at the left.

M. HAYWOOD, Pres

**Haywood
Tire
& Equip-
ment Co.**

501 Capitol
Avenue
Indianapolis
Ind.

WRITE TODAY

M. HAYWOOD, President
Haywood Tire & Equipment Co.
501 Capitol Ave., Indianapolis, Ind.

DEAR SIR: Please send me by return mail your free book on the new Haywood Tire Surgery Method and the details of your free school of tire repairing.

Name
Address



A Natural Shock Absorber

IT IS an indisputable fact that no acceptable substitute for curled hair as an upholstery filler has as yet been discovered or invented.

But curled hair has been advanced a step farther in usefulness by the scientific methods of WILSON & CO.

WILSON Woven Curled Hair

is woven securely onto burlap forming a thick, sanitary, resilient pad which prevents the hair from shifting or bunching.

Its extraordinary resiliency is based on the concerted resisting power of millions of tiny hair spirals. These miniature spirals everlastingly absorb shocks and pressures without losing their "pep" or springiness. They last—and there lies a tremendously important economy.

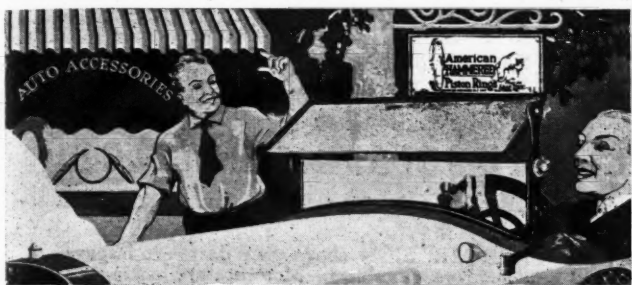
First cost is final cost, if you use Wilson's Woven Curled Hair to safeguard the seats and backs of your cars.

It is a prestige builder for the upholstery of which it is a part—and for the car of which you are the maker.

Send us blueprints of seats and backs, specify requirements, and we will submit prices and samples.

Write for our free booklet—"Comfort in Upholstery." Address Dept. MA-7

This mark  your guarantee
CHICAGO



Send your customers away smiling with AMERICAN HAMMERED PISTON RINGS

IT means winning good will and future trade. American Hammered Piston Rings will make good for the individual car owner just as they are making good in thousands of cars, trucks and tractors for the country's foremost motor builders.

*And they're making good
for hundreds of jobbers
and dealers.*



They're used
by Pierce-
Arrow,
White, Winton,
Stearns,
Oakland,
Mercer Duesenberg,
Kelly-Springfield
and scores
of others.

The sort of factory co-operation we give our distributors is the talk of the trade. We'd like to tell you all about it. Write us now, while your mind is on the subject.

AMERICAN HAMMERED PISTON RING CO.
General Sales Office, Newark, N. J.
Plants at Newark and Baltimore

NAME	POSITION	SALARY
John	AUTOMOBILE ENGINEER	\$125 A WEEK
	REPAIR MAN	\$50 A WEEK
	CHAUFFEUR	\$30 A WEEK

Put Your Name On This Pay-Roll

Men like you are wanted for big-pay positions in the fascinating field of automobile engineering. We have made it easy for you to fit yourself for one of these positions. You don't have to go to school. You don't have to serve an apprenticeship. Fifteen automobile engineers and specialists have compiled a spare time reading course, that will equip you to be an automobile expert without taking any time from your present work.

AUTO BOOKS

5 Volumes Shipped Free

Now ready for you—an up-to-the-minute five-volume library on Automobile Engineering, covering the construction, care and repair of pleasure cars, motor trucks and motorcycles. Brimming over with advanced information on Lighting Systems, Garage Design and Equipment, Welding and other repair methods. Contains everything that a mechanic or an engineer or a motorcyclist or the owner or prospective owner of a motor car ought to know. Written in simple language that anybody can understand. Tastefully bound in American Morocco, flexible covers, gold stamped, 2,400 pages and 2,000 illustrations, tables and explanatory diagrams. A library that cost thousands of dollars to compile but that comes to you free for 7 days' examination.

Partial List of Contents

Explosion Motors
Welding
Motor Construction
and Repair
Carburetors & Settings
Valves, Cooling
Lubrication
Fly-Wheels
Clutch
Transmission
Final Drive
Steering Frames
Tires
Vulcanizing
Ignition
Starting and Lighting
Systems
Wiring Diagrams
Shop Kinks
Commercial Garage
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Electrics
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Motorcycles
Commercial Trucks
Glossary

Only 7c a Day Not a cent to pay in advance. First you see the books in your own home or shop. Just mail coupon and pay express charges when books arrive. You can read them and study them for seven whole days before you decide whether you want to keep them or not. If you like the books send only \$2 in seven days and \$2 a month until the special introductory price of \$17.80 has been paid. (Regular price \$25.00.) Along with the set goes a year's consulting membership in the American Technical Society. (Regular price \$12.) This great bargain offer must soon be withdrawn.

Send No Money Now

Don't take our word for it. See the books without cost. There is so much profit in this offer for you, that we urge you to waste not a moment in sending for the books. Put the coupon in the mails today. Send no money—just the coupon!

American Technical Society Dept. A413, Chicago, Ill.



American Technical Society
Dept. A413, Chicago, Ill.

Please send me the 5-volume set, Automobile Engineering, for 7 days' examination, shipping charges collect. If I decide to buy, I will send \$2 within 7 days and the balance at \$2 a month until the \$17.80 has been paid. Then you send me a receipt showing that the \$25.00 set of books and the \$12 Consulting Membership are mine and fully paid for. I think I can get along without the books after the seven days' trial I will return them at your expense.

Name _____
Address _____
Reference _____



Install a Curtis Air Compressor

Display a CURTIS "FREE AIR" SIGN above your door—it inspires confidence and will help build your business. Motorists are looking for this familiar CURTIS slogan—because they know oil rots tires—and that a CURTIS Air Compressor furnishes AIR FREE FROM OIL, which means fewer blowouts, greater tire mileage and less repairs. The CURTIS is the ONLY Garage Air Compressor with the controlled splash oiling system that eliminates all danger of forcing oil into the air line.

CURTIS AIR FREE FROM OIL

Investigate the many exclusive features of CURTIS Garage Air Compressors. The line is complete—five sizes—stationary or portable. Just write your name and address on the margin of this advertisement—tear it out and send it to your jobber, or to us direct, for complete information and prices.

Curtis Pneumatic Machinery Co.

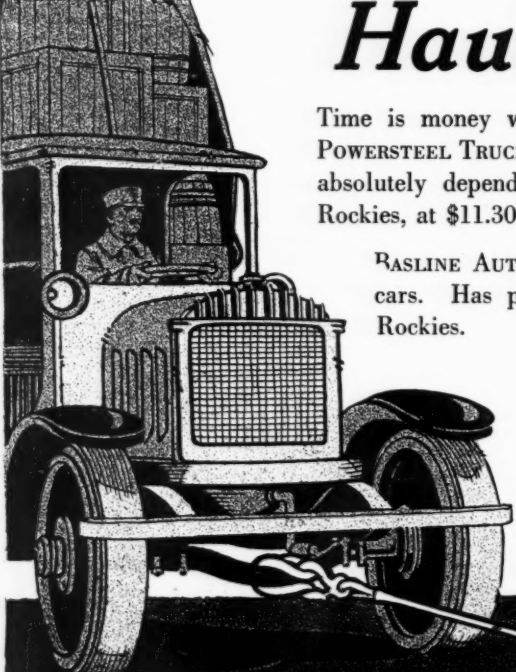
1527 Kienlen Ave., St. Louis, Mo.

Branch Office—530-H Hudson Terminal, New York City



The Curtis Sign

Illustrated above—is 10x14 inches—baked enamel on steel. Cannot be bought, but is furnished FREE with every CURTIS Garage Air Compressor—and cannot be had in any other way.



Hauls Heaviest Loads

Time is money with a motor truck. Safeguard against delays, with POWERSTEEL TRUCKLINE. Made of famous Yellow Strand Wire Rope, it's absolutely dependable. Attaches instantly, securely. Retails, east of Rockies, at \$11.30 with plain hooks; \$12.75 with Snaffle Hooks.

BASLINE AUTOWLINE, is a smaller edition, for use on passenger cars. Has patented Snaffle Hooks. At dealers, \$5.80 east of Rockies.

POWERSTEEL AUTOWLOCK, a safeguard against stealing of car or spare tire, has strong lock that can't be picked. At dealers, \$2.35 east of Rockies.

DEALERS: Send for particulars of our Money-Making Proposition.

BRODERICK & BASCOM ROPE COMPANY

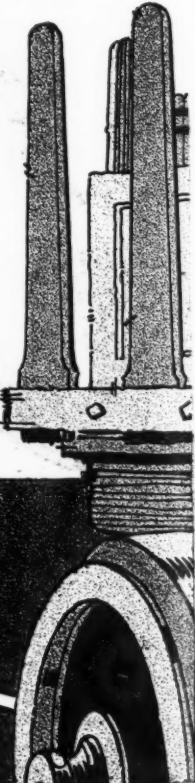
SAINT LOUIS

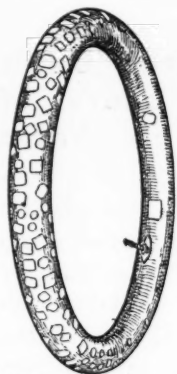
NEW YORK

Manufacturers of Celebrated Yellow Strand Wire Rope—Helped in building Panama Canal

C6

POWERSTEEL TRUCKLINE





176 Punctures —
Run 1200 Miles—
60 lb. Pressure—
No Leaks.

ZIP! TIRE PATCH

ONE MINUTE AND-ZIP!-IT'S ON

Zip is one of the best little sellers among automobile accessories. Once a car owner uses it he never wants any other because ZIP takes hold of the tube and stays right where it's put until the tube is sold for junk.

Zip requires no cement, no sand paper, no heat or skill. And it has enough selling points to cheer the heart of any dealer. For instance, Zip is applied in a minute, it stays in hottest weather, it edges feather down, and with all that it costs less!



2 Ft. Patch—Run
1500 Miles—90 lb.
Pressure—No
Leaks.

ZIP! That's How Sales Are Made

Every time you sell a carton of Zip you know you'll sell another one. They always ask for Zip the second time.

Your sales will be many and your profits liberal. Zip is sold in handy dollar cartons.

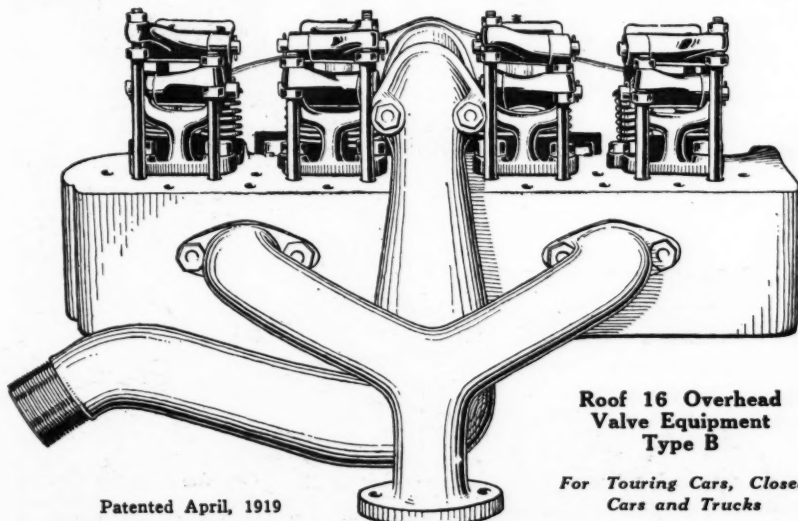
Write for proposition and discounts.

ONE MINUTE VULCANIZING CO.

Rosedale, Kansas (Suburb of Kansas City)

POWER and SPEED

Roof 16 Overhead Valve Equipment



Roof 16 Overhead
Valve Equipment
Type B

For Touring Cars, Closed
Cars and Trucks

Patented April, 1919

The Most Remarkable Power Device, Even in This Inventive Age

Hill climbing for touring cars—pulling power through sand and mud—doubles the hauling capacity of converted Ford truck—speed for mile and half-mile tracks to rival the fastest cars built. Ford racing cars with our Cylinder Head Equipment and special racing parts have attained speeds from 80 to 100 miles per hour. Type A for speed—Type B for touring cars, closed cars and trucks. Price, complete, \$100.00, f. o. b. factory. Nothing extra to buy. Cylinder head Equipment all ready for installation. It takes the place of the regular Ford Cylinder Head. Any mechanic can easily and quickly install it.

Comparison Brake Horse Power Tests at the United States Bureau of Standards gave Standard Ford motor with regulation carburetor 18.7 Horse Power. The same motor with 16 Valve Head and regulation carburetor 22.4 Horse Power. The same motor with 16 Valve Head and Special carburetor 29.7 Horse Power. We are Manufacturers and Distributors of speed and other specialties for Ford cars; 3 to 1 gears, high speed camshafts, aluminite, light grey iron pistons, lynite pistons, aluminite connecting-rods, racing spark plugs, racing

carburetors, roller bearings, counterbalances, wire wheels, multiple speed transmission, high tension magnetos, special oiling system, special worm and gear, steering gear, racing tires, racing bodies, hood and radiator, parts for underslinging chassis. Tell us what you want. We can supply it. Racing quality. Lowest prices. Send for our Complete Literature on how to build fast cars and double the value of your converted Ford Truck and descriptive circular on Speed and other Specialties for Fords.

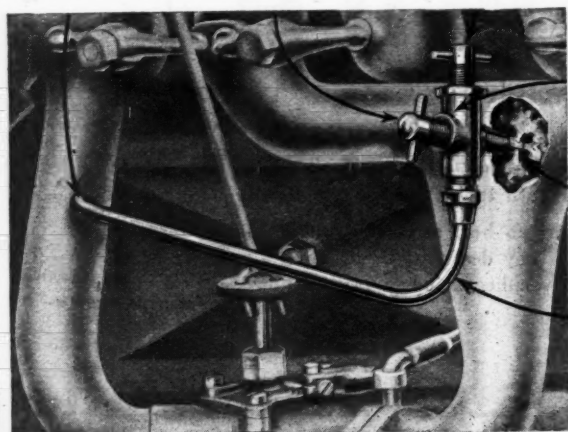
LAUREL MOTORS CORPORATION

Anderson, Indiana, U. S. A.

Shows AERODYN hot air intake tube in position in carburetor hot air intake pipe.

Priming screw is turned to left to allow motor to be primed.

Adjusting screw for regulating mixture for different engines.



Hole for Priming.

Shows how thoroughly the AERODYN VALVE mixes hot air with gas vapor.

AERODYN hot air intake tube.

Gasoline Bills Don't Frighten Users of the Aerodyn Valve

You can cut down your gasoline bill over 24% and get more than 17% more power than you are getting now by installing an Aerodyn Valve. This device can be attached to any car in fifteen minutes. It corrects the mixture and by its action completely vaporizes all gas that goes through the carburetor. This perfectly vaporized gas gives a minimum of carbon and increases the power.

The Aerodyn Valve is absolutely automatic in its operation. Once properly adjusted, never needs to be changed.

For \$4.50 you will receive an Aerodyn Valve. Use it constantly for 30 days. If you are not more than satisfied return it and get your money back. Dealers, we have a profitable proposition for you.

The Standard Auto Manufacturing Co.

814 Genesee St.

Syracuse, N. Y.

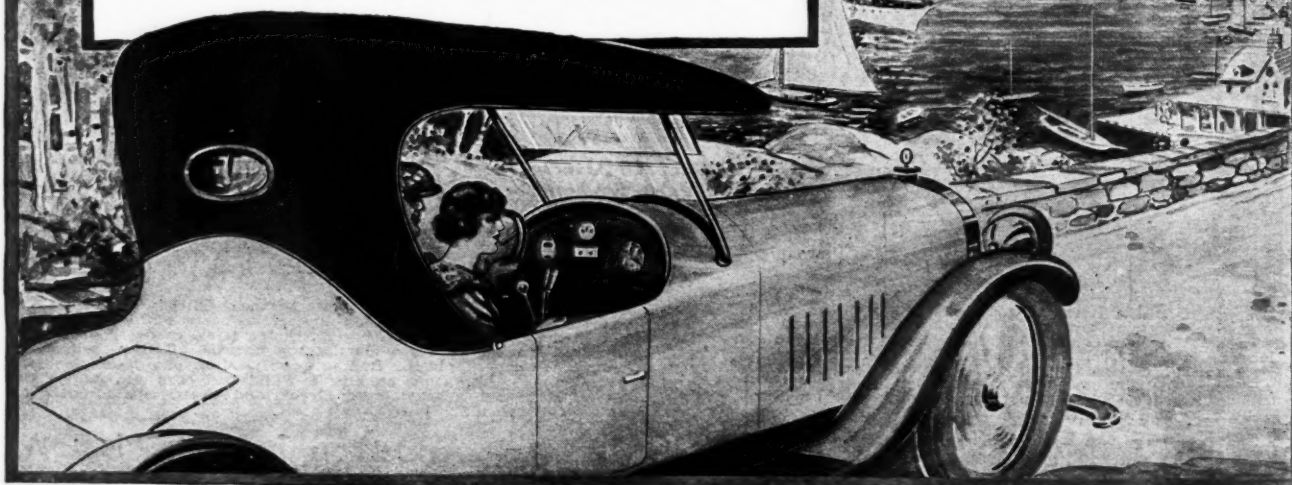
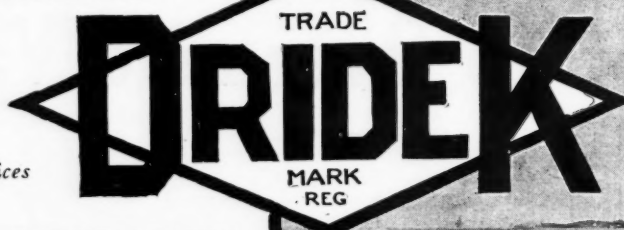
AERODYN VALVE

The Most Remarkable Automobile Top Material

LIGHT IN WEIGHT — DEPENDABLE IN QUALITY — NON CRACKING — NON BLISTERING—Dridek is Made to Satisfy.

Send to Dept. C for Samples and Prices

L. J. MUTTY COMPANY
BOSTON, MASS.



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Quality

ANTI-FRICTION bearings of the ball type, such as the New Departure Double Row or Radax, are the only bearings that will successfully withstand thrust loads with absolutely no resultant wedging action.

When other than ball bearings are employed, the thrust stresses intensify the internal pressures even as the blow of the woodsman's sledge intensifies the side pressure of wedge against log.

Nothing moves as easily as a ball. No other form of load-carrier moves with so little frictional resistance. That is why ball bearings reduce the evils of friction in your motor car or other machinery to a minimum.

THE NEW DEPARTURE MANUFACTURING COMPANY,
Bristol, Conn.

452

New Departure Ball Bearings



**MOST JOBBERS
AND
DEALERS
SELL
THE
ROSE LINE
OF
PUMPS
AND
GREASE
GUNS**

**ROSE
PRODUCTS
ENCIRCLE
THE
GLOBE**

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Crippled me
and
I ain't got
up again

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has me
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no more

**MFG BY
J.H. HANEY & CO
HASTINGS NEB**

TENAX

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BY THE NAME

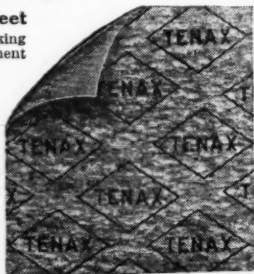
The Original Blue Sheet

An ideal compressed asbestos packing for any joint. Tenax is permanent whether subjected to gas engine exhaust, cylinder explosions, acid, alkali, superheated steam or any other active agent. Can't burn, rot or squeeze out.

The finest packing made for Automobiles, Tractors and Gas Engines.

Sheets 50 inches square. Thickness 1-32 inch to 1/2 inch, inclusive. Made also in 1-64 inch thickness, black graphited sheet only.

PACK WITH TENAX
and forget the joint
forever



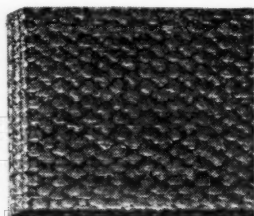
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For automobiles, trucks, tractors and all engineering brakes.

Finest long fibre asbestos yarn with wire. Extra long wearing quality. Can't burn or soak oil. Made in all widths and thickness. A big seller to the trade who know where to buy.

Write Now for our New Automotive Supplies Catalog, or ask your Supply House.



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Manufacturers of automobiles realize the value of beauty as a sales factor. Consequently they demand glass of high quality—at a reasonable price.

Crystal Sheet Glass, while considerably less expensive than plate, possesses every element of beauty and quality essential to high grade automobile construction.

It is strong, uniform in thickness, perfectly transparent, and of the proper degree of flexibility.

Ask us to explain in detail why **Crystal Sheet** is the logical glass for your cars.

AMERICAN WINDOW GLASS CO.

World's Largest Producer

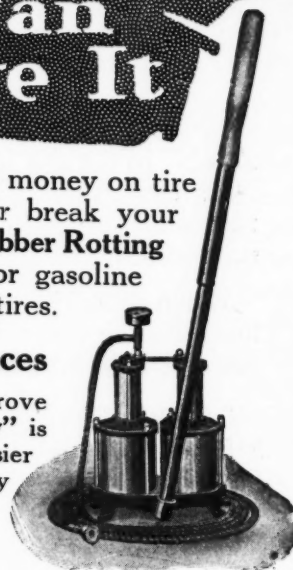
GENERAL OFFICES: FARMERS BANK BUILDING
Pittsburgh, Pa., U. S. A.

At Our Risk— You Can Prove It

Don't waste good money on tire pumps that either break your back, or pump **Rubber Rotting** Oil particles or gasoline fumes into your tires.

Take No Chances

At our risk you can prove that the "**Dead Easy**" is quicker, safer, easier and cheaper than any other tire pump, either engine drive or hand power.



Convenient to carry with any car, it is always ready for instant service. The gauge showing exact tire pressure, there is no guesswork—and it's "**Dead Easy**."

FREE TRIAL OFFER—Write today, NOW, for fifteen day—no-money-in-advance—free trial offer.

GLOBE MANUFACTURING COMPANY
BATTLE CREEK, MICHIGAN, U. S. A.

What Garagemen Think About "TRIPLEXD"

Extract
No. 5

3Years

(Another Testimonial to
Triplexd Permanence)



I. J. Smith, Irving
Garage, 1005-7 Ave.
Q, Brooklyn, N. Y.

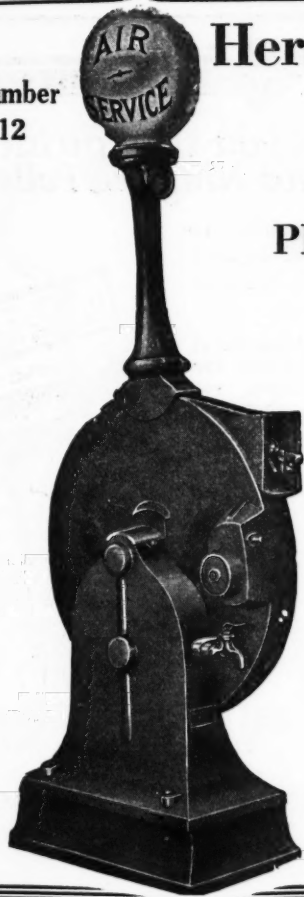
"NEARLY three years ago, June 5, 1915, I purchased a length of this hose, the 3/4" size. For six months I used it at Ocean Parkway and Kings Highway, after which time I moved to Ave. Q and Coney Island Ave. and made sure that the hose—after such excellent service at the first station—came with me to the new place. It has been in constant service at this place, a very busy auto thoroughfare since originally installed. . . . This hose has been outside all the time exposed to all sorts of weather, as well as receiving such knocks and abuse as gasoline hose usually gets."

Watch for What Garagemen Think from Week to Week

TRIPLEXD

METAL HOSE & TUBING CO.
INCORPORATED
235 Tillary St
BROOKLYN, N. Y.



Number
12

Here's What You Want to Know About the

ECO

PREPAYMENT AUTOMATIC AIR STATION

"It pays for the upkeep of the air service and is continually bringing forth favorable comment."

The above is quoted from a letter written us by an ECO user in New Haven, Conn.

It illustrates not only the profit value of ECO Stations, but also their popularity, which is the basis of paid air success.

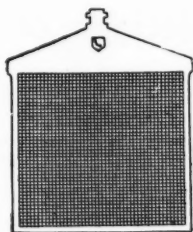
Patrons prefer the *Service* of the ECO to the *cheapness* of free air. ECO Stations pay.

Ask your jobber about ECO. If he can't serve you send us his name and write direct.

WESTERN MANUFACTURING COMPANY

Oskaloosa

Iowa



The silver radiator of a Roamer identifies a motor car which represents the ultimate in beauty of design, power of performance, and individuality of appointments. The Roamer offers a notable sales opportunity for any progressive motor car merchant.

BARLEY MOTOR CAR COMPANY
Kalamazoo, Michigan.

The **ROAMER**
America's Smartest Car

When Writing to Advertisers Please Mention Motor Age

TIP-TOP OF AKRON TI-RE-PAIR OUTFIT

Tip-Top Ti-Re-Pair Equipment is regarded by tire manufacturers, tire repair schools and repair shops as representing the highest standard of quality in vulcanizing equipment. The fact that we are one of the largest manufacturers of tire building equipment in the U. S. has given us the experience to produce the highest efficiency equipment for repairing tires.

TIRE REPAIRING

We make a complete line of tire repair equipment—Cavity Vulcanizers of both the self-contained steam boiler and the separate boiler types—Tube Plates—Steam Boilers—Bead Molds—Tire Repair Tools, etc.

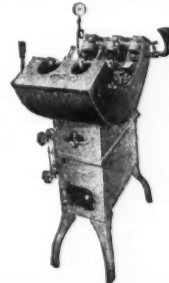
TIRE RETREADING

Every tire repair shop should have one of our recently developed Type E Cavity Retreading Outfits. Handles either plain or ribbed treads. Takes up little room in the shop, is much less expensive than retreading kettle and boiler, and is generally preferred both as to quality of results and convenience in use. Fitted with patented non-heat conducting, wood end blocks.

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Address
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means vitality and long life to your battery and is just as simple as putting water in your radiator, if you own a highly efficient full wave

F-F MAGNETIC RECTIFIER

Attaches to any lamp socket and fully charges the average starting battery unattended over night on 6c worth of current without removing the battery from car or disconnecting the battery terminals.

Simple—Safe—Sure Acting. Infusible and long wearing carbon electrodes rectify the current. Anyone can operate it.

Also F-F Charging Rheostats for charging batteries from Direct Current and Farm Lighting Plants.

Either type of F-F BATTERY BOOSTER is portable and furnished complete with Ammeter and Battery Clips. Larger sizes come in Panel Form.

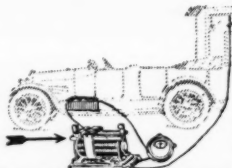
Three years on the market, thousands in use and fully guaranteed. Every battery owner needs one.

Price \$24 for Type 166 for 110 volt 60 cycle line, and any 6 volt battery.

Send check for prompt shipment
or write for Bulletin 14.

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And that's all there is to it.

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An illustrated guide to points of interest in and around Buffalo and Niagara Falls. Free on request.

When in Buffalo, stop at the Hotel Lenox—Buffalo's ideal hotel for motorists. Quietly situated, yet convenient to theater, shopping and business districts and Niagara Falls Boulevard. First-class garage.

European plan. Fire-proof, modern. Unexcelled cuisine. Every room an outside room.

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HOTEL LENOX

Is Your Tire Pump Complete

Price
in U. S.

50c.



With a

SCHRADER UNIVERSAL PUMP CONNECTION

attached to your tire pump you are saved the labor of pumping your tires up beyond the required pressure. It permits the measuring of the inflation without disconnecting the pump and the tire.

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Service Stations & Garagemen

Big worth-while profits with astonishing increase of trade

immediately follows your taking on

NEW YORK REPLACEMENT IGNITION COILS

95% of all cars are coil equipped—every one a prospect. No large investment necessary. A few dollars will start you because a small quantity of different model coils fit ALL CARS.

Fifteen years' coil building experience enables us to produce a coil that gives a crashing big hot spark—even when battery is low—that insures easy starting and perfect running on present day low-grade gas.

They are guaranteed for the life of the car. Don't let your competitor get the nicest piece of business ever offered but write today for trade prices and circular giving list of proper coil for each model car.



New York Coil Co.
338 Pearl Street New York, N. Y.

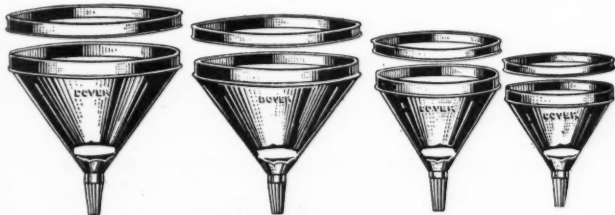
NEW DOVER Two-in-One Offset Oil Funnel



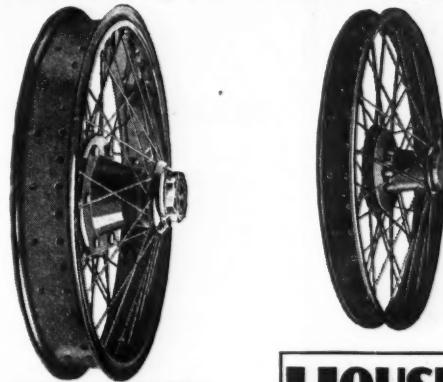
This funnel nominally has a projecting spout at an angle $2\frac{1}{4}$ inches long. Another spout is furnished 8 in. long, with an offset of 3 inches. This spout can be attached to either end of the tube on the funnel, which gives the advantage of two angles as shown in cut.

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QUICK CHANGE

We can supply immediately, sets of Houx Wire Wheels for all the cars listed and any of the service stations below will gladly install them.

Dealers should send at once for the particulars of our service and sales agency proposition.

Buick	Dort	Lexington	Scripps-Booth
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Chevrolet	Hudson	Oldsmobile	Westcott
Cole	Hupp	Overland	Winton
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HOUSE
EASY CHANGE

Set of 5 House Wire Wheels, 4 inner hubs, 4 hub caps, 4 hub cap wrench, spoke nipple wrench, one hub dust cover for spare wheel. White, Black, Red; color optional. For Fords, \$65.

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The Perfect One-Piece Piston Ring

See the interlocking double step joint which allows an expansion of from 1-8 inch to 3-16 inch before any loss of compression occurs. The Gill Piston Ring is listed in the catalogs of hundreds of leading jobbers.

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Jobbers! Write for full details.

THE GILL MFG. CO., 351 W. 59th St., Chicago, Ill.

DON'T REGRIND SCORED CYLINDERS

The Lawrence Patent Process will repair them by fusing a silver nickel alloy into the scores. This is then refinished down to the wall surface, making a clean, smooth job, **for the life of the cylinder.** Regrinding is eliminated with its frequent call for new pistons and rings.

SEND TO FACTORY NEAREST YOU

We give you a 24-hour service on all blocks. This, plus shipping time, is the only time lost—but cylinders made perfect by this process are well worth waiting for.

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are also made as good as new by the Lawrence method—and we do the job without *preheating*, and you know preheating often warps. Give your trade this service at only one-fifth the cost of re boring.

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SCORED CYLINDERS AND SAND-FAULTS CORRECTED

TRADE
LAWRENCE
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BORE PRECISION MAINTAINED
CYLINDER SCRAPPING ABOLISHED



Traffic Cops

One of the strongest boosters for a good warning signal is the traffic cop, and he will tell you that the

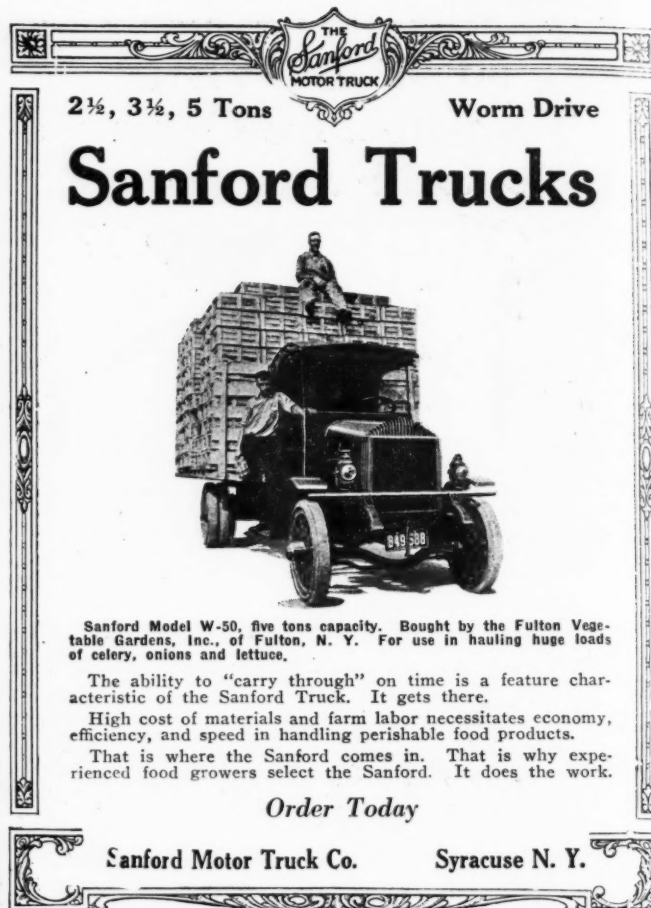
BUELL EXPLOSION WHISTLE

prevents more accidents to cars and persons than any other device he knows of. That is because the Buell's note of warning—direct from the engine—is so pulsatingly strong and powerful that it commands instant attention.

53 Manufacturers specify the Buell. If you are an owner, you need it; if a dealer you are losing money if you do not handle it. Write at once.

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2½, 3½, 5 Tons Worm Drive

Sanford Model W-50, five tons capacity. Bought by the Fulton Vegetable Gardens, Inc., of Fulton, N. Y. For use in hauling huge loads of celery, onions and lettuce.

The ability to "carry through" on time is a feature characteristic of the Sanford Truck. It gets there.

High cost of materials and farm labor necessitates economy, efficiency, and speed in handling perishable food products.

That is where the Sanford comes in. That is why experienced food growers select the Sanford. It does the work.

Order Today


Sanford Motor Truck Co. Syracuse N. Y.

Speed Strength Endurance

ROGERS ALL-STEEL TRAILERS, in all models, styles and sizes (½-ton to 10-ton capacity). Dumping Trailers, 4-wheel and 2-wheel Trailers, Semi-Trailers, highest quality, easiest running, longest lasting.

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By **JOHN B. RATHBUN**

PRACTICAL treatise on gas, gasoline, oil and steam engines. Oil burners for use in steam engines are also included. Special emphasis is placed on farm tractors and their operation, both oil and steam driven. The engines described are the latest types, and include the Diesel, Semi-Diesel, Gnome, Low and Turbine types.

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Flexible Leather \$1.50 Silk Cloth \$1.25
370 Pages, 150 Illustrations

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ANTI-OIL-LEAK PISTON RING

Here is a piston ring guaranteed to be absolutely oil proof, thereby preventing spark plug fouling and carbon formation.

A knife edge lip with groove for gathering oil and outlet passage at bottom of ring allow excess oil to flow back into crankcase through holes drilled in piston ring groove for that purpose. This results in a saving of oil from 40 to 50% as well as a saving in fuel, because of perfect oil control.

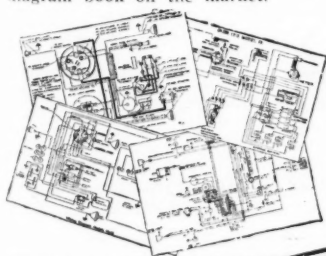
Write for circular giving full particulars, prices, testimonials, etc.

THE WELEVER PISTON RING CO., Inc.
113-19 Superior Street TOLEDO, OHIO

850 WIRING DIAGRAMS

In New Edition of AUTO ELECTRICIANS GUIDE

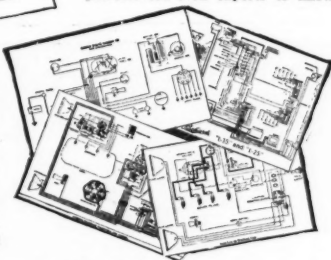
Contains wiring diagrams for every car on the market including the new 1919 Starting and Lighting Systems for Ford cars, also diagrams for Baker R. & L. and Detroit Electric and pipe connections for Stanley Steamers. Covers all kinds of systems from 1912 to 1919 and many as far back as 1906. Most complete diagram book on the market.



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DETROIT, MICH.



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Automatic Extension Reel

For Electric Lamps

Take your lamp to any part of your Garage or Shop, locking and unlocking at any desired point. Automatically rewinds the cord when you are through with the light.

STRONG AND DURABLE. Send for full particulars and prices. Remember that it is not in any way a "half-baked" proposition nor an amateur outfit, but a splendidly constructed and practical piece of mechanism for men who haven't got time to bother with nonsensical makeshifts. Equipped with 25 feet packinghouse cord, handle, socket and lamp guard.

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At the same time you will be dealing in a guaranteed-to-satisfy product. The Triangle patch is all rubber. There is enough in the package that retails at \$1.00 to fix 100 punctures.

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CLIP THIS COUPON FOR PROFITS

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Send your direct-to-dealer proposition on Triangle Tire Patch to

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We have secured a large quantity of Small Motors, Generators and Charging Outfits. This material is new, still in original cases and carries the full factory guarantee. This is Your Opportunity to buy new, guaranteed Electrical Apparatus of Standard Manufacture



Battery Charging Outfits

For use on 110 volt. A. C. 60 cycle, single phase current only

50 watts, 8 volts, 30 amperes \$48.50

150 watts, 20 volts, 3 amperes \$68.50

150 watts, 15 volts, 10 amperes \$68.50

500 watts, 30 volts, 10 amperes \$94.50

All outfits complete with switch-board as cut shown.

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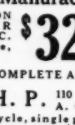
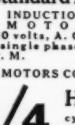
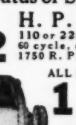
250 POLYPHASE MOTORS 1750

60 cycle, 3 or 3 phase. Complete outfit and box.

1 H. P. \$102.50 2 H. P. \$112.50

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MANUFACTURERS DIRECTOR

West End

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STOP using dangerous, inconvenient, expensive Tow Lines.

The WEAVER Towing Pole furnishes a rigid connection between the cars and allows the brakes of the towing car to absolutely control the towed car. No jamming on sudden stops or down grades. Eliminates accidents, saves time, will out-wear hundreds of tow lines.

WRITE FOR WEAVER CATALOG describing this product as well as the full Weaver line of Shop Equipment.



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Ambu Electric Trouble Shooter. Locates and diagnoses the trouble in the Starting and Lighting system of any Motor Car, 1911 to 1920. Saves hours of time.

Cadmium Tester: Leads and voltmeter—simplest easiest means of testing battery plate. Sets—complete—\$25.

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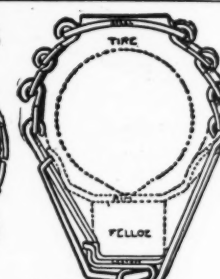
Steel Tires & Mud Chains



Try 2 or 3 sections over any old blowout. Can't have blowouts, punctures; neither can the rubber wear off.

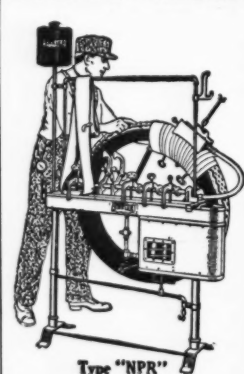
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Mud chains can be put on in a jiffy with one hand while standing on the running board. Hook the ends together and push the little lever. If you get in a mud hole you will laugh out loud.

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Type "NPR"

The high cost and limited supply of tires offers repair men a big opportunity to make money. Experienced help not necessary. A boy can do it easily.

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SHOP VULCANIZER

Has Automatic Heat Control Requires no watching or regulating. It works automatically. Easy to operate—can't over-cure or under-cure. Large capacity—repairs 12 casings and 200 tubes a day. Type N. P. R., price \$70 subject to trade discounts.

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THE DYNETO shows greatest efficiency in both motor and generator. Type D. A. Motor develops a torque of approximately 15 pounds. Type C. A. Generator shows approximately 15 amperes.

A car-speed of 15 to 20 M. P. H. keeps batteries fully charged.

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A Joint typical of its name

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ADD FUEL SUPPLY**

Protect the Ignition System

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THE Fisher
RIM-GRIP SUB-CASING



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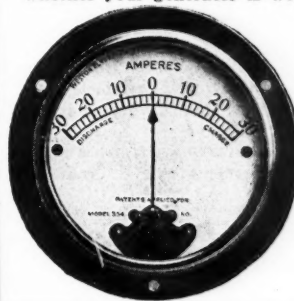
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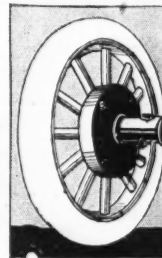
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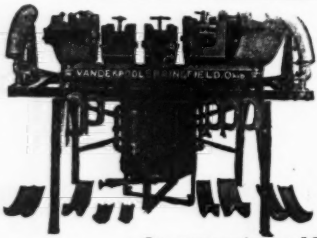
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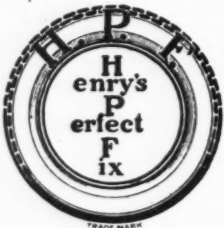
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Repairs Tubes and Tires Easily

Every motorist should carry one of these inexpensive and efficient self vulcanizing outfits in his tool box. Make a display on your counter or in your window and see how easily and quickly

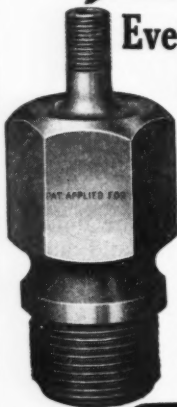
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Every 5 lbs. lost compression means 7.2% lost power



Learn how much lost compression your engine suffers—and find out where it is lost and what to do, by simply removing spark plug and screwing in a

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Use an accurate tire gauge and instantly the degree of lost compression—and the reason for it—are revealed. Do this whenever you please, save garage expense, and have a better running, more powerful engine, by making occasional tests with the S & N Compression Plug. Strong, simple, inexpensive. Mention size of spark plug. \$1.25 post paid. Write for folder.

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Unless you are absolutely satisfied with the crankshaft machining you are now getting it would pay you to investigate our ability and equipment

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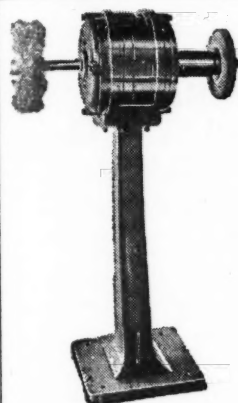
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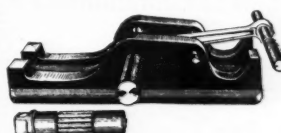
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USERS: This outfit will pay for itself immediately

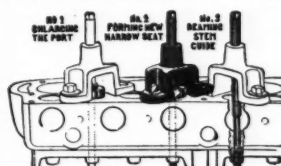
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Are absolute necessities in every repair shop.

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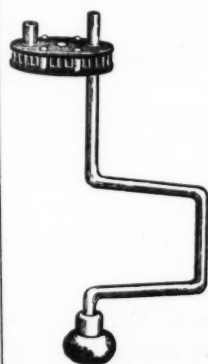
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Removes the FORD FOURTH CONNECTING ROD NUT in three minutes. Made strong—all steel, 3-inch offset. Sent prepaid for \$4.50. Ask your jobber. If he can't supply you, write us.

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A TYPE FOR ANY MOTOR

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Ford Lifter \$1.00

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Sales Department—Staff & Eckhouse, 612-622 S. Michigan Ave., Chicago.



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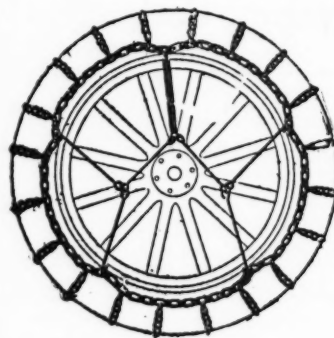
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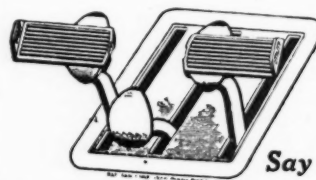
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A light, easily portable electrically operated tool. Does a better job with greater convenience.

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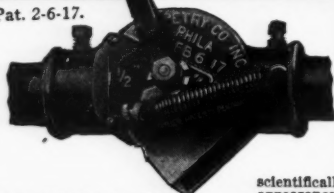
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Small Washers

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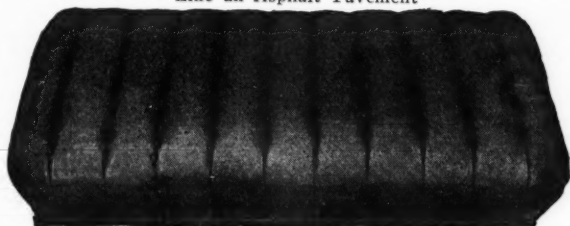
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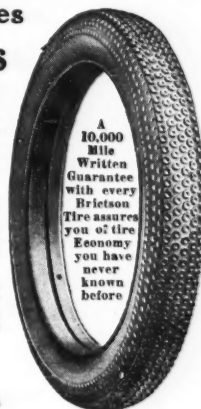
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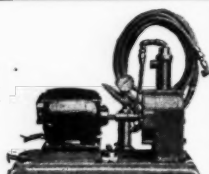
Write for particulars. Already there are over 10,000 of our vibrating type Battery Chargers making big money for garage and repair men.

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1-1½ and 1½-2 Ton
CAPACITIES

FULLY EQUIPPED
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NEW VICTORY MODEL
Over 100 improvements
Strength increased 50%, endurance 75%, economy 25%
The only new Six this season, and the greatest advance ever made in this type.

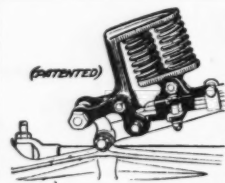
Wheelbase, 120 inches. Motor, 40 h.p. Five-Passenger Touring Car, \$1575 at factory. Three-Passenger Roadster, same price.
Write for particulars



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Absorb shocks by spring cushion effect instead of adding to bounce of the car. Thus there is practically no recoil to the springs or the car. Absolutely guaranteed.
This is a real, profit-making seller for dealers. Write for sales proposition.

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Continental Motors
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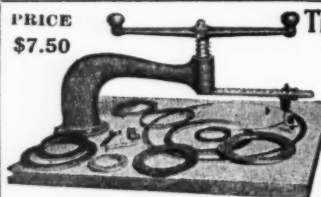
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PRICE
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Dependable Delivery
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The Motor Truck bought today without Electric Starting and Lighting will be out of date tomorrow



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A Few Live Dealers Wanted for **MUTUAL**

"America's Greatest Truck"

2-3½ and 5-ton, with Electric Light, Enclosed Cab, and Metal
Wheels as part of regular equipment.

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WATSON Trailers

Built for Motor Service at
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INCREASE your Trucking
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With a Watson Trailer and
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The Lowest Priced Truck in America for Its Carrying Capacity
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\$1495
With Internal
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Indispensable to every garage—worth 5 times its small cost.
Strong, simple, efficient. One stroke raises either or both
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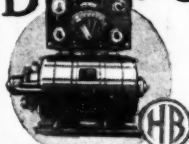
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These steel bands, or ring gears, are to replace the
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HB Battery Charging Equipment will pay \$100 to \$400 a month CLEAR
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Type. No burn-outs or expensive renewals. No electrical knowledge
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Tire Pump ever produced. 90 lbs. before you
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Dealers—You sell them on our guarantee that they cannot
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This covers every good point a spark plug can have. Sell
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Black Finishing and Rubbing
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FOR PARTS, ACCESSORIES, TIRES, MACHINERY, REBUILDING, REPAIRING, WELDING AND USED CARS. ALSO HELP AND SITUATIONS WANTED AND MISCELLANEOUS CLASSIFIED ADVERTISING.

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EVERY PART GUARANTEED ON A MONEY BACK BASIS

WRITE to our nearest branch for prices on any parts you need. See for yourself that *guaranteed* used parts cost you no more than the kind you take chances on.

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PREVAILING
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We quote prices and FURNISH parts for 87% of the inquiries we receive. It is impossible for any concern to furnish **every** part inquired for, but you are reasonably sure of getting just what you want from us and when you want it. And you are absolutely sure of getting your money back if the part is not right in every way.

"The World's Largest Used Parts Concern"

ALL ORDERS
FILLED

THE SAME DAY
RECEIVED

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Abbott-Detroit	Chase	Gleason	Interstate	Michigan	Parry	Stafford
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Apperson	Cole	Great Eagle	King	Moline	Pierce-Arrow	Stevens-Duryea
Atlas	Crow-Elkhart	Great Northern	Kissel	Moon	Pope Hartford	Stoddard-Dayton
Atterbury	Dorris	Great Smith	Knox	National	Pope Toledo	Studebaker
Auburn	Elmore	Great Western	Krit	Nyberg	Premier	Stutz
Bergdoll	E-M-F 30	Havers	Little	Oakland	Rambler	Thomas-Detroit
Brush	Everett	Haynes	Locomobile	Ohio	R. C. H.	Vellie
Buick	F. A. L.	Herff-Brooks	Lozier	Oldsmobile	Regal	Vim
Cadillac	Firestone	Henderson	Marmon	Overland	Reo	Warren
Carter Car	Flanders	Hudson	Marquette	Packard	Schacht	Wayne
Case	Ford	Hupmobile	Matheson	Paige	Seidon	Wescott
Chadwick	Franklin	International	Maxwell	Palmer-Singer	Speedwell	Winton
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Write for Prices

One of our branches is located conveniently near you. Any of the three will gladly quote you prices on parts for any make or model car. Or if you want your parts immediately send your order and the parts will be shipped to you the same day your order is received.

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Every Used Part Is in First Class Condition, and Will Render Satisfactory Service.
If We Cannot Satisfy You, Your Money Will Be Cheerfully Refunded.

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All in Excellent Condition
UNIT POWER PLANTS

New Keystone, 6 cyl.	200.00
4 cyl. Chalmers 30.	75.00
4 cyl. Herreshoff.	75.00
Continental Type C.	125.00
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Cole 6	125.00
Haynes 13-14	100.00
Maxwell 16-17	100.00
Herschell Spillman, 6 cyl.	125.00
New Sun 6 cyl. with Starter and Generator	225.00
1916 Abbott	200.00
Continental Type C, with starter and generator	175.00
6 cyl. Northway (Olds), with starter and generator	200.00
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MOTORS—ONLY

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New Sun 6 cyl. with Starter and Generator	150.00
1914 Cadillac, with starter and generator	125.00
1914 Mitchell, 4 cyl.	75.00
1914 Mitchell, 6 cyl.	100.00
1913 Velie, 4 cyl.	75.00
Alco, 4 cyl.	75.00
2 cyl. Beaver (Clark Truck)	40.00
1910 Winton Six	75.00
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Cadillac 15-4	100.00
Cadillac 13-4	90.00
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Studebaker 15-6	100.00
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Pierce Arrow 6-36	125.00
Pierce Arrow 6-48	150.00
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Liberal allowance made on your old motor	
Cylinder Blocks, Pistons, Shafts, etc., for most all motors	

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Overhauled and Guaranteed	
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New DU6 Bosch.	35.00
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DR4 Bosch 2 spark.	65.00
DR6 Bosch	25.00

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We Buy Bosch Magnets, Hair and Leather, in Any Quantity

DR6 Bosch 2 spark.	75.00
D4 Bosch	15.00
D6 Bosch	17.50
D6 Bosch 2 spark.	45.00
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NU4 Bosch	15.00
ZR6 Bosch	55.00
ZR4 Bosch 2 spark.	100.00
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New Dixie Mags. 4 cyl.	18.00
Sims H. T.	12.00
Mea	12.00

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Bosch Type A	\$7.50
Bosch Duplex	4.00
Eisemann	4.00
Splitdorf	4.00
Silent Starter and Generator Chains; all lengths and sizes.	

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Disco 16 E-12 volt.	35.00
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Intz Chalmers	35.00
Northeast	20.00

Apple-A28 for Mitchell.	25.00
Wagner 13 Studebaker.	25.00
Remy S J 2.	35.00
Remy No. 535.	35.00
Jesco	25.00
20 Delco	20.00
Gray & Davis 2 Unit.	35.00
Westinghouse S W 1158 A.	30.00
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GENERATORS

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Ward Leonard AG T.	10.00-12.00
Splitdorf	12.00
Vesta	12.00
Berdon	10.00
Delco Oakland	10.00
Bijur, Series 51-30-5.	15.00
Ward Leonard for King.	15.00
Rushmore No. 1.	15.00
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Remy with distributor.	20.00
Westinghouse with distributor	25.00
230-221	14.50
Leech-Neville, 12 volt.	10.00
Northwestern	10.00
Autolite	10.00-15.00
New Westinghouse 209 R.	20.00

STARTERS

Autolite No. 7049-2407-6145	\$15.00-\$20.00
Autolite for Abbott.	15.00
Gray Davis Chalmers.	20.00
Leech-Neville Haynes	20.00
Gray Davis, Lozier and others.	30.00
Autolite, Overland 79, 81, 83.	15.00-20.00
Bijur Apperson	25.00
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Remy 182	20.00
Packard	20.00
Denco	20.00
Starter for Palmer Singer.	20.00
Westinghouse 533-S W 103.	25.00
Allis Chalmers	15.00
Wagner for King.	20.00

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\$150.00 to \$550.00
50 to 75 exceptionally good used cars at prices so low that they would even interest dealers.

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Stewart or Warner \$1.50 to \$4.00

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All Styles and Makes \$2.00 Up

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Stanweld 32 x 3 1/2-34 x 4 SS.	4.00
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Rim Lugs and Nuts for All Cars	.15
New Steering Posts.	5.00
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Rear Axles	15.00 to 40.00
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Transmissions	15.00 to 100.00
Carburetors	5.00 to 9.00
Bearings	.50 to 3.50
Springs	1.00 to 3.50
Transmission Gears.	1.00 to 5.00
Differential Gears	5.00 to 10.00
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Gasoline Tanks.	1.00 to 5.00
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Windshields	3.50 to 8.00
Spotlights	3.50
Extra Good Stewart Vacuum Tanks	6.00
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In New Partt and Material

New Autolite Ammeters, 20 amp.	\$ 1.50
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National Standard Medium Jacks	1.50
Heavy Grease Guns.	.60
50 New Adjustable T Bump-ers, Nickel or Black, fit all cars except Fords, each.	4.50

NEW LAMPS

11 inch single bulb.	\$6.00
10 inch single bulb.	5.00
Electric tail-lights	.85
Electric side lights, pair.	1.75

NEW BRAKE LINING

Price per foot	
1 1/4-in., 20c	1 1/4-in., 25c
1 1/4-in., 30c	2-in., 30c

FLEXIBLE TUBING

Price per foot	
1 1/4-in., 25c	1 1/4-in., 30c
1 1/4-in., 35c	2-in., 40c
2 1/4-in., 45c	2 1/2-in., 50c

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New Bailey Differentials for Overland Models, 80, 81, 83. \$10.00

Prest-O-Lite Tanks

Model B.	\$4.00 each; E.	\$3.00 each
Searchlight Tanks		\$2.00

NEW WIRE WHEELS FOR FORDS

Set of 4 wheels and 5 rims, \$45.00. \$5.00 allowance for old wheels.

NEW TIRES

5000 Mile Guarantee

Size	Ribbed Tread	Non-Skid	Size	Ribbed Tread	Non-Skid
31x3 1/2	\$12.50	16.00	34x4	\$21.00	\$22.50
32x3 1/2	\$15.00	16.00	34x4 1/2	21.00	22.50
31x4	20.00	20.00	34x4 1/2	25.00	27.50
32x4	17.50	18.50	35x4 1/2	27.50	30.00
33x4	20.00	21.00	35x5	30.00	32.50
			37x5	32.50	35.00

10% Deposit Required with each tire ordered
Balance C. O. D. subject to examination

30x3	\$1.75	34x4	\$3.00
30x3 1/2	2.00	36x4	3.50
32x3 1/2	2.25	35x4 1/2	3.25
32x4	2.50	36x4 1/2	3.50
33x4	3.00	37x4 1/2	3.75

NEW RELINERS

GOOD USED TIRES & TUBES

OBTAINED FROM WRECKED CARS
WRITE FOR PRICES

MAIL ORDERS SHIPPED SAME DAY
HIGHEST PRICES PAID FOR WRECKED CARS

DEPOSIT REQUIRED

WITH
ALL ORDERS

WARSHAWSKY & CO.

LARGEST CAR WRECKERS IN THE WORLD

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WE HAVE NO BRANCH STORES

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We Save You 50 to 80% of the Original Cost

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New Spotlights, 5" lens with mirror\$3.48

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Model E..... 3.00 ea.

Searchlite Tanks. 2.00 ea.

COILS

Bosch Type A.....\$6.50

Eisemann 3.50

Splittorf 3.50

STARTERS

Gray & Davis.....\$14.00

Auto Lite, Bendix Drive..... 17.50

Jones Starter and Generator..... 20.00

GENERATORS

Gray & Davis.....\$14.00

Remy 12.00

Vesta 10.00

Silent Starter and Generator

Chains, all lengths and sizes.

Lighting and Starting Pat-

enters\$6.00 to \$15.00

Rims 1.50 to 3.50

Carburetors 3.50 to 7.50

5% Off for Cash in Full with Order.

Deposit Required with All Orders.

Get Our Prices on New Tires.

MAGNETOS

New

Bosch ZR6.....\$40.00
Bosch ZR4..... 35.00
Bosch DU6..... 32.00
Eisemann G4..... 27.50

Bosch DU4 Variable... 24.50
Bosch DU4 Set Spark...\$20.00
Bosch DU6..... 27.50
Bosch DR4..... 13.50
Bosch DR6..... 20.00

Magnetos Overh'd & Guaranteed

Bosch ZR6..... 35.00
Bosch D4.....\$14.00
Bosch D6..... 15.00
Eisemann 12.00
Remy 6.00
Dixie 11.00

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REBUILT BATTERIES

Guaranteed for 6 Months
6 Volt Starting and Lighting Batteries\$13.50
12 Volt Starting and Lighting Batteries 18.50

MOTORS

In Excellent Condition

Continental Model E.....\$75.00
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4 cyl. Studebaker 25..... 50.00
4 cyl. Everett 30..... 45.00
4 cyl. Davis 30..... 50.00
Overland 69..... 60.00
Overland 83 with starter and generator.....\$100.00

UNIT POWER PLANTS

Continental Model E.....\$115.00
Chalmers 30..... 65.00
Radiators\$10.00 and up
Speedometer Heads.....\$1.00 to \$3.00
Axle Shafts\$2.50 to \$7.50
Front Axles Springs
Rear Axles Transmission Gears
Transmissions Differential Gears
Roller Ball Bearings (All Makes), \$1.00 to \$3.50. Pistons, Cylinder Blocks, Crank and Camshafts, etc.

Full Cash Refunds, less Express Charges, Allowed on Returned Goods. Prompt Attention to Your Orders.

OUR SLIGHTLY USED Tires and Tubes

OBTAINED FROM WRECKED CARS
Mean Economy to You—A Trial Will Convince You

Size	Tires	Tubes
30x3	\$ 4.50	\$1.35
30x3 1/2	5.50	1.45
31x3 1/2	5.75	1.50
32x3 1/2	6.00	1.50
34x3 1/2	6.50	1.60
31x4	7.00	1.65
32x4	7.50	1.60
33x4	8.50	1.70
34x4	8.50	1.70
35x4	9.00	1.75
36x4	10.00	1.75
37x4	12.50	1.75
34x4 1/2	9.00	1.75
35x4 1/2	9.25	1.80
36x4 1/2	9.50	1.85
37x4 1/2	11.00	1.90
35x5	10.25	2.00
36x5	10.25	2.00
37x5	10.75	2.20
40x4 Non-Skid.	15.00	

Express Must Be Prepaid on Old Tires Sent to Us.

Special New Tires

32x4 Clincher.....\$10.00 35x4 1/2 Clincher..... 15.00

Double tread Tires

Selected from best used material obtainable.

Retainers, \$1.25 Extra

Two tires, one with good top and other with good sidewalls are trimmed, cemented and sewed firmly together by Campbell lock stitch method, twelve to fourteen plies fabric making puncture and blowout almost impossible.

Size	Complete tire	You furnish one tire	You furnish both
28x3	\$ 4.15	\$ 3.00	\$ 1.50
30x3	4.75	3.35	1.50
30x3 1/2	5.80	4.25	2.00
31x3 1/2	6.50	4.50	2.00
32x3 1/2	6.75	5.25	2.00
34x3 1/2	7.00	5.60	2.25
31x4	6.95	5.75	2.50
32x4	7.15	5.65	2.50
33x4	7.80	6.25	2.50
34x4	8.00	6.45	2.50
35x4	8.75	7.15	2.50
36x4	9.40	7.50	2.50
33x4 1/2	9.25	7.00	3.00
34x4 1/2	9.65	8.00	3.00
35x4 1/2	10.15	8.20	3.00

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Watch These Bargain Boxes!

A million parts a year pass through our big shops. Every customer is satisfied or money promptly refunded. Quick service!

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and Save Greatly!

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THE ORIGINAL "WE TEAR 'EM UP AND SELL THE PIECES"

13th and Oak Streets

KANSAS CITY, MO.

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Auto Lite Jackson 15 5.00
Auto Lite Overland 81 12.50
Auto Lite Overland 75 12.50
Auto Lite Overland 83 12.50
Wagner Spec. 154 15.00
Remy Model 182, 6 volt; Detroit 8 15.00
Remy Model 6; Mitchell 4 and 6 cyl. 10.00
Gray & Davis 6 volt; Paige 4-36 15.00
Gray & Davis Type Y, 6 volt; Maxwell 29, 1914 10.00
Westinghouse Frame 318, Type B, 6 volt 20.00
Deaco Starter Model U F, Type S G, 8 volt 10.00
Ward Leonard, Type D L, 6 volt 10.00
Delco Single Unit Starter Generator & Distr., Cole 6 30.00
Delco Starter Generator Cadillac 12 30.00
Leece-Neville, Haynes 20.00
Ents Starter and Generator Chalmers 50.00
Type D S L 12 v. Starter and Generator 15.00
Simms-Huff Starter and Generator, Type H K 15.00
Apelco Starter and Generator Type A25, 12 v. 15.00

GENERATORS

Westinghouse Generator and Distributor, 6 cyl.\$17.50
Deaco Generator and Distr., 6 volt, 8 amp., 4 cyl. 17.50
Westinghouse 209 R 20.00
Westinghouse 208 R 20.00
Apelco S R 3, 7 volt, 7 amp. 10.00
Ward Leonard Type B L 15.00
Ward Leonard 6 volt, 10 amp. 15.00
Wagner Spec. E M 126 Studebaker 20.00

Parts and Repairs

Parts and Repairs

Parts and Repairs

NEW PARTS FOR ALL CARS

PURITAN MACHINE COMPANY

BEHIND

PURITAN EQUIPMENT

ESTABLISHED 1901

18 YEARS IN BUSINESS

WE DO NOT WRECK CARS

SEND FOR OUR MONTHLY BULLETIN "WISE BUYS FOR WISE BUYERS"

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AXLE SHAFTS
BALL CUPS
BEARINGS
BRAKE LINING
CLUTCHES
CONES
CRANK CASES
CRANK SHAFTS
DIFFERENTIALS
FANS
FENDERS
FRONT AXLES
GEARS
GENERATORS
HUBS
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PISTONS

IGNITION MATERIAL
6 Volt Model G. G. Auto-
lite Generator\$15.00
6 Volt Model G. H. Auto-
lite Generator 15.00
Cuno Cigar Lighters for
Maxwell and Dodge..... 1.95
6 Volt Ward Leonard start-
ing motors 15.00
6 Volt Lighting Generator
with attachments for
Fords 23.00
Bosch DU6 Magneto—New 40.00
Bosch DU4 Magneto—Re-
built 35.00
Dimmer Switches 1.00
2 Gang Lighting Switch
with dimmer75
6 Volt K-2 Atwater Kent
Unsparkers 10.50
6 Volt K-2 Atwater Kent
Coils 5.00
**STARTING AND LIGHTING
BATTERIES—BRAND NEW—
GUARANTEED BY THE
MANUFACTURER FOR ONE
YEAR.**
6 Volt 80 Amp.....\$25.00
6 Volt 110 Amp..... 30.00
12 Volt for DODGE and
MAXWELLS 36.00

FOR FORDS
Fletcher Carburetors complete
with Hot Air Stove and Tub-
ing. Price\$ 8.50
Speedster Bodies..... 60.00
Sport Bodies—complete with top
and wind shield.....120.00
18-in. Steering Wheels. Cor-
rugated grip 3.95
Crown fenders—Heavy type—
long 15.00
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Model '15, \$10—model '17, \$12. Other
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Firestone	National	Stoddard-Dayton
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Cameron—Crawford
Detroit—Enger 40
E. M. F. 30—Fal Car
Flanders 2 & 3 speed
Firestone Columbia
Fuller
Ford—N. R. & S.
Great Northern
Halladay—Haynes 1910
Herschoff—Hupp 20
Hudson 20
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Tires
Parts and RepairsTires
Parts and Repairs

Tires

WE DEFY THE WORLD TO EQUAL OUR QUALITY

Compare Prices with Others.

One Trial Will Convince You of the
Great Values We Give

WE HAVE IN STOCK over \$100,000 worth of High Grade Tires which were slightly blemished in the manufacture. These blemishes do not, in any way, interfere with the wearing quality of these tires, but are simply sold without our regular 5000-mile guarantee.

Just order a few of these high-grade tires, and if, when you receive them, they are not entirely satisfactory to you, return them to us immediately and we will cheerfully refund your money, providing the tires have not been used. These Tires are the best trade builders any dealer could buy. Don't let an opportunity of this kind slip through your fingers. ORDER TODAY, while our stock is complete and you can get any size you may need.

AT THESE PRICES

War tax paid by us.

We do not collect the
tax from Dealers.

PRICES TO DEALERS ONLY

Size	Non-Skid	Inner Tubes
28x3	\$ 9.00	\$1.95
30x3	8.50	2.15
30x3½	10.75	2.50
31x3½	11.30	2.60
32x3½	12.50	2.70
31x4	16.05	3.35
32x4	16.30	3.45
33x4	17.05	3.55
34x4	17.40	3.65
35x4½	24.10	4.50
35x5	27.40	5.25
37x5	28.10	5.50

TERMS: 10% deposit and we will ship balance C. O. D.

ORDERS FILLED SAME DAY RECEIVED

BUCYRUS TIRE & RUBBER CO., of Illinois

1406 Michigan Ave. CHICAGO, ILL.

Phone Calumet 1380

Our Customers Stay and Boost A Trial Order Will Show You Why

A Complete Stock of Slightly Used and Factory Repaired

T TIRES I TIRES R TIRES E TIRES S

A SATISFIED CUSTOMER IS OUR BIGGEST ASSET, THEREFORE
WE MUST SATISFY YOU

Size	Used Tire	New Tube	Size	Used Tire	New Tube	Size	Used Tire	New Tube
30x3	\$4.50	\$1.95	32x4	\$7.75	\$3.05	35x4½	\$9.25	\$4.25
30x3½	5.50	2.30	33x4	8.50	3.25	36x4½	9.50	4.40
31x3½	5.75	2.40	34x4	8.50	3.40	37x4½	10.00	4.50
32x3½	6.00	2.40	35x4	8.75	3.50	35x5	10.25	4.60
34x3½	6.50	2.60	36x4	8.75	3.65	36x5	10.25	4.70
31x4	7.00	3.00	34x4½	9.00	4.15	37x5	10.75	4.75

SPECIAL BARGAINS IN ODD SIZES

35x5 Clincher	\$ 8.00
42x4½ Clincher	15.00

Send \$1.00 deposit with each tire ordered. Tires will be sent promptly, with privilege of examination, and balance C. O. D. Specify style of rim to avoid delay.

Our Used Tires are not guaranteed for any definite number of miles, but we will make reasonable adjustments on all tires that do not give service in proportion to the price paid, providing tires are returned to us by prepaid express. Is not this fair enough?

WE CARRY A COMPLETE STOCK OF NEW TIRES
WRITE FOR PRICES, STATING SIZE DESIRED

LINCOLN TIRE & SUPPLY CO.

1463 South Michigan Avenue, Dept. I, CHICAGO, ILLINOIS

Hupp 32 & EMF Parts

160 DIFFERENT MAKES CARS IN PARTS
SEND US YOUR OLD PIECES
PROMPT ATTENTION
UNITED AUTO WRECKERS
Main Yard, 541-549 Wyoming St., Dayton, O.
PHONE E-3067

Lozier Owners—Why buy counterfeit repair parts? We have all Original Parts. Made from original patterns. Order from headquarters.

LOZIER MOTOR COMPANY
FORT AND 6th STREETS, DETROIT, MICH.
SERVICE STATIONS:
E. A. Cornley, Inc., 1445 Bush St., San Francisco, Cal.
Lozier Motor Co., 47th St. & 11th Ave., New York City

When Writing to Advertisers Please Mention Motor Age

Big Reduction
High Grade New

TIRES AND TUBES

Size	Tire	Tube
28 x 3	\$ 7.75	\$1.80
30 x 3	7.75	1.80
30 x 3½	10.10	2.05
32 x 3½	11.80	2.20
31 x 4	15.40	2.90
32 x 4	15.75	3.00
33 x 4	16.45	3.15
34 x 4	16.85	3.25
33 x 4½	21.95	3.50
34 x 4½	22.70	3.65
35 x 4½	23.75	3.75
35 x 4½	24.10	3.80
35 x 5	27.00	4.15
36 x 5	28.00	4.20
37 x 5	28.65	4.25

Add 10% for Non-Skid.

10% Deposit required with Order,
Balance C.O.D., Subject to Examination.

The Armstrong Tire & Vulcanizing Co.

1342-44 Michigan Ave., Chicago, Ill.
Phone Calumet 5212 and 2199

SPECIAL OFFER

To Dealers On
NEW HIGH GRADE

T U B E S

DOZEN LOTS

Or More—All Sizes

\$1.35 Each.

Brand New

30x3½ N.S. Casings

\$9.50 Each.

We Can Quote You Interesting Prices on
All Solid and Pneumatic Tires
ACORN TIRE & RUBBER CO.
1350-54 S. Michigan Ave., Chicago

Tires

Tires

Tires

TIRES

—Job Lots—

Obsolete, Surplus Stocks and
Factory Seconds
WRITE—CALL

Broadway Tire Jobbers
250 West 54th St. NEW YORK

Good News!

This Substantial Reduction Is
Your Gain

Compare Our Prices
Then Order

QUALITY COUNTS

New Fresh Stock, Assorted Brands

Size	New Tires	Used Tires	New Tubes
28x3	\$ 7.80	\$ 5.00	\$1.75
30x3	9.80	6.00	1.75
30x3½	11.55	7.50	2.20
32x3½	13.45	8.00	2.55
31x4	15.15	8.50	2.70
32x4	15.40	8.50	2.75
33x4	16.10	9.00	2.85
34x4	16.50	10.00	2.90
35x4	18.75	10.00	3.30
36x4	19.30	10.50	3.40
33x4½	21.45	10.50	3.45
34x4½	22.20	11.00	3.55
35x4½	23.20	11.00	3.65
36x4½	23.55	11.50	3.75
37x4½	26.95	11.50	4.30
35x5	29.10	12.50	4.40
36x5	29.90	13.00	4.85
37x5	30.75	13.50	4.55

Add 10% for Non-Skid Cases or Red Tubes. Special Prices to Dealers—Let Us Know Your Wants.

MAIL ORDERS SOLICITED

10% Deposit Required with Order, Balance C. O. D., Subject to Your Examination and Approval.

SERLIN TIRE CO.

Incorporated
1300-1302 Michigan Ave., Chicago, Ill.
PHONES: CALUMET 3407-3408

LIBERTY-OMAR TIRES

Standard Firsts

GUARANTEED 3,500 MILES

Adjusted on Mileage Basis

FOLLOWING PRICES ARE FOR DEALERS ONLY

Size	Ribbed Tread	Non- Skid	Tubes	Size	Ribbed Tread	Non- Skid	Tubes
30x3	\$ 9.00	\$ 9.50	\$2.25	34x4	\$20.00	\$21.00	\$3.75
30x3½	12.00	12.25	2.50	32x4½	24.00	25.00	4.10
32x3½	12.75	13.50	3.00	33x4½	25.00	26.00	4.25
31x4	18.00	18.50	3.00	34x4½	26.00	27.00	4.25
32x4	18.50	19.25	3.20	35x4½	27.00	28.00	4.50
33x4	19.25	20.00	3.50	36x4½	28.00	29.00	4.60

ALL TUBES ARE GUARANTEED FOR ONE YEAR

Terms: 5% discount allowed if check in full accompanies order. Will ship C. O. D. with privilege of examination, if desired.

Send Sample Order

IDEAL TIRE COMPANY

1512 VINE ST.,

PHILADELPHIA, PA.

TIRES AND TUBES

SLIGHTLY USED TIRES

OBTAINED FROM WRECKED CARS AND
FACTORY REPAIRED

Size	Tires	Tubes	Size	Tires	Tubes
30x3	\$ 4.50	\$1.35	35x4	9.00	1.75
30x3½	5.50	1.45	34x4½	9.00	1.75
32x3½	6.00	1.50	35x4½	9.25	1.80
31x4	7.00	1.65	36x4½	9.50	1.85
32x4	7.75	1.60	35x5	10.25	2.00
33x4	8.50	1.70	36x5	10.25	2.00
34x4	8.50	1.70	37x5	10.75	2.20

NEW TIRES

NEW, FRESH STOCK
Exceptional Bargains

Size	Tires	Tubes	Size	Tires	Tubes
28x3	\$ 8.60	\$1.85	35x4	\$20.60	\$3.50
30x3	8.35	1.80	36x4	21.25	3.60
30x3½	10.80	2.20	33x4½	23.60	3.75
32x3½	12.70	2.30	34x4½	24.40	3.90
34x3½	14.80	2.70	35x4½	25.50	4.05
31x4	16.65	2.85	36x4½	25.90	4.60
32x4	16.95	2.90	37x4½	29.65	5.25
33x4	17.70	3.00	35x5	29.10	4.90
34x4	18.10	3.10	36x5	29.90	4.75
			37x5	30.75	4.90

ADD 10% FOR NON-SKID

\$1.00 Deposit Required With Each Tire Ordered, Balance C. O. D., Subject to Examination. Specify Style of Rim.

AUTO NEEDS COMPANY

1602 Michigan Ave.
Chicago, Ill.

Good Double Tread Tires, All Sizes Guaranteed 3000 Miles

30x3	\$ 5.25	32x4	\$ 8.75
30x3½	6.25	33x4	9.00
32x3½	7.50	34x4	9.50
31x4	8.25	35x4½	11.50

Refiner free with each tire. One dollar deposit with all C. O. D. orders.

REBUILT TIRE CO.

123 N. Rose St. Kalamazoo, Mich.

Samuel L. Winternitz & Company
AUCTIONEERS

Largest Liquidators of Motor Plants
FIRST NAT. BANK BLDG. CHICAGO, ILL.

No Deposit Required

ON OUR TIRES

Real 5000 Mile

Guaranteed Tires

The Best Bargains Obtainable

28x3	\$11.00	31x4	22.50
29x2½	10.00	32x4	22.90
30x3	11.85	33x4	24.50
30x3½	14.40	34x4	21.80
32x3½	17.00	34x4½	31.90
35x4½	33.10		

Demonstrating

All Non-Skid **TIRES** All Non-Skid

They Are MUCH BETTER
Than the Ordinary Used Tires

Size	Tire	Tube	Size	Tire	Tube
30x3	\$ 6.50	\$1.75	32x4½	\$13.00	\$2.35
30x3½	7.50	1.90	33x4½	13.50	2.50
32x3½	9.00	2.00	35x4½	14.00	2.65
32x4	10.50	2.15	36x4½	15.00	2.75
33x4	11.50	2.25	35x5	15.50	2.85
34x4	12.50	2.35	37x5	16.50	2.95

5% Off for Cash in Full with Order. Otherwise, goods shipped C. O. D., subject to examination. Specify whether clincher or straight side.

Royal Tire & Supply Co.

1461 Michigan Avenue CHICAGO, ILL.

Special Bargains in

SLIGHTLY USED TIRES

The Kind That Will Satisfy All Customers

30x3	\$4.50	32x4	\$7.75	35x4½	\$ 9.25
30x3½	5.50	33x4	8.50	36x4½	9.50
31x3½	5.75	34x4	8.50	37x4½	10.00
32x3½	6.00	35x4	8.75	35x5	10.25
34x3½	7.00	36x4	8.75	36x5	10.25
31x4	7.00	34x4½	9.00	37x5	10.75

Send \$1.00 deposit with each tire ordered. Balance C. O. D., subject to examination. Specify if Clincher, Q. D., or Straight Side.

American Tire & Vulcanizing Co.

Phone: Calumet 5170
2136 S. MICHIGAN AVE., CHICAGO, ILL.

When Writing to Advertisers Please Mention Motor Age

Tires

MR. DEALER!

U Need a Competitive Tire!
When the customer says:—*He can buy a Tire cheaper around the corner; That's the time for you to spring this competitive Tire on him*

"WILOXATLANTIC" TIRES

30x3	Nonskid	.....	\$ 7.01
30x3 1/2	"	.....	8.88
32x3 1/2	"	.....	10.38
31x4	"	.....	13.87
32x4	"	.....	14.11
33x4	"	.....	14.82
34x4	"	.....	15.13

These tires are "first's" wrapped in paper, bearing Serial Number and Mr's Name.

Order just one small size Tire for a **SAMPLE**, after you see sample, you will order a hundred or more.

ATLANTIC TIRE & RUBBER CO.

1305 Maryland Ave. Baltimore, Md.

Rebuilding and Repairing

Send Your Scored Cylinders to Lawrence

There is a branch near you as noted in this advertisement. The Lawrence patented process eliminated reboring, therefore will save your customer the expense of buying new pistons and rings. In this process, we fuse silver nickel alloy then grind it flush with cylinder wall.

Cracked Water Jackets

are repaired by this process without pre-heating—insures against warping. We run a 24-hour service at our factory giving you the quickest kind of action. Write to the branch nearest you for full information. There is big money and satisfaction in this work for you.

L. LAWRENCE & COMPANY

CHICAGO.....1522 Michigan Ave.
NEW YORK CITY.....791-793 11th Ave.
CLEVELAND.....1810 Prospect
NEWARK, N. J.....292 Halsey Street
DETROIT.....1246 East Jefferson

SAN FRANCISCO.....116 Hyde St.
PHILADELPHIA.....1601 Summer Ave.
LOS ANGELES.....335 Washington St.
MILWAUKEE.....18 to 24 Martin St.
MEMPHIS, TENN.....247 Poplar St.

Cord Type Tires**REBUILT****New Rubber****3-PLY RELINER****Vulcanized in Each Tire**

30x3 1/2	.....	\$ 9.95
32x3 1/2	.....	11.50
31x4	.....	14.50
32x4	.....	14.95
33x4	.....	15.95
34x4	.....	16.50
34x4 1/2	.....	18.50
35x4 1/2	.....	18.95
36x4 1/2	.....	19.50

Deposit of \$1.00 on C. O. D. orders

State whether S. S. or Clincher

YALE DETROIT CYCLE CO.

502-504 Grand River, Detroit

CYLINDER GRINDING**New Oversize Pistons, Rings and Wrist Pins**

Highest grade machinery and tool equipment, no makeshift tools. This equipment with our years of experience in the automotive business insures you highest grade work at the hands of experts. Work fully guaranteed. Patterns for all pistons, 25,000 piston rings and 5,000 wrist pins in stock. We are the acknowledged leaders in our line.

Aluminate Pistons and Connecting Rods

put six cylinder smoothness into four cylinder motors, give any motor more power, more speed, quicker get away and more miles per gallon with less bearing trouble.

Power Plus Cylinder Head for Ford Cars

keeps the motor cool, increases power and speed.

Expert Motor Building and Overhauling

Motors refined and tuned for speed. New and rebuilt motors in stock. Tell us your motor problems. Our increased equipment and space insures prompt service and perfect work.

Ask Our Customers**Green Engineering Company**

Dayton, Ohio

Cylinders Reground

Over 800 Piston Patterns Always in Stock.

Our Expert Mechanics and our Highest Grade Equipment are your guarantee for highest class workmanship.

Our Special Light Alloy Pistons will give you More Power—More Speed. We also do Gear Cutting of Spur and Bevel Gears.

Write to Us Today**Auto Engine Works**

St. Paul, Minn.

CYLINDER and**CRANKSHAFT GRINDING**

Oversize Piston, Rings and Wrist Pins made to fit. Skilled mechanics and Special Accurate Machinery. Write for our booklet for prices and useful information.

MODERN AUTO REPAIR & RECONSTRUCTION CO.
4661-3-5-7-9-11 Olive St., St. Louis, Mo.

Standard Used Tires

Best Values Ever Offered for the Money

SAVE YOURSELF 75%

By Buying Your Summer Needs Now

Size	Used Tire	New Tubes	Size	Used Tire	New Tubes
30x3	\$ 4.50	\$1.75	33x4 1/2	\$10.00	\$2.50
30x3 1/2	5.50	1.90	34x4 1/2	9.25	2.60
32x3 1/2	7.00	2.00	35x4 1/2	10.00	2.65
32x4	7.50	2.15	36x4 1/2	10.00	2.75
33x4	9.00	2.25	35x5	10.50	2.85
34x4	9.00	2.35	37x5	11.50	2.95

\$1 deposit required with each tire ordered, balance C. O. D. subject to examination. Specify clincher or straight side.

5% Off for Cash in Full With Order

GOODWAY TIRE CO.

1463 MICHIGAN AVE. CHICAGO

REAL VALUES HIGH GRADE NEW TUBES AND TIRES

Some PRICES on NEW TIRES and Tubes

Size	Plain	Non-Skid	New Tubes
30x3	\$ 7.55	\$ 8.90	\$1.70
30x3 1/2	9.75	10.85	2.10
32x3 1/2	11.35	13.10	2.25
31x4	12.00	16.80	2.60
32x4	15.15	16.95	2.75
33x4	15.95	17.85	2.85
34x4	16.25	18.40	2.95

10% deposit required with order, balance C. O. D. privilege examination.

Carl G. Wiesenmeyer

"The Tire King"

Springfield, Ill.

TRY US ONCE!!

On cylinder grinding. New equipment and we are in a position to give you prompt, economical and satisfactory service. New pistons, rings and pins, if desired.

Send for our price list.

ST. PAUL AUTO CYLINDER GRINDING CO.
1152 Rice St., St. Paul, Minn.

SCORED CYLINDERS

We guarantee to repair any cylinder that has been scored by loose piston pin with out heating or grinding. Use same pistons. A mechanical process patented 1917. Has given satisfaction for past three years.

TERRITORY WITH MACHINE SOLD TO LIVE REPAIRMEN
Write for Descriptive Literature.

A Profitable Business

EAGLE MACHINE COMPANY

INDIANAPOLIS, IND.

Rebuilding and Repairing

Rebuilding and Repairing

Rebuilding and Repairing

If you (rebore) cylinders—STOP—GRIND them. It will increase your business and add to your profits. The HEALD NO. 60 Cylinder Grinding Machine is built especially for regrounding cylinders. May we have your name and address for literature?

THE HEALD MACHINE CO.

Worcester, Mass.

TRINDL MACHINE WORKS

57-59-61 East 24th Street

SPECIALISTS IN

CHICAGO, ILLINOIS

PISTONS—PISTON RINGS—WRIST PINS

CYLINDER GRINDING

Scored Cylinders Repaired

By Patented Process

CRANK SHAFT GRINDING

Factory Distributors of

"GILL"

PERFECT ONE PIECE PISTON RINGS

PHONE COLISEUM 2320

QUALITY
SERVICE

Write for Our
Illustrated Book-
let.

SEND YOUR CYLINDER GRINDING TO KANSAS CITY

We have a fine plant, equipped with the most modern facilities for cylinder grinding and fitting of pistons and wrist pins. Our workmen are experts. All jobs inspected before shipping.

QUICK SERVICE AND ATTRACTIVE PRICES TO GARAGE AND REPAIR MEN

1505 McGee Street

HARRY LEE MACHINE WORKS

Kansas City, Mo.

Attention CAR OWNERS

Winter driving demands strong engines. Why not give that trouble a knockout punch by having the

Cylinders Reground

AND EQUIPPED WITH NEW

PISTONS, PINS AND RINGS

by the

BUTLER MFG. CO.

INDIANAPOLIS, IND.

Steel Gear Rings

For Self-Starters

For replacements or new installations

Silent Chain Sprockets

For

Generator & Magneto

Drives

Our Prices Will Interest You

The Adapt Machinery Company

1624-1632 S. Wabash Ave.

Chicago, Ill.

CYLINDER GRINDING

Complete job for
FORDS—\$17 PER CAR

Cylinders reground, new pistons ground and fitted, also new rings, bushings and wrist pins. Cylinders for other cars, trucks, tractors, and motor boats reground at moderate cost on B. & S. and Heald grinders. Pistons turned and fitted. Our work is guaranteed to be correct within one-third of a thousandth.

FROSTHOLM BROS.

1809 Park Street Syracuse, N. Y.

Cylinders Reground

Scored or cracked cylinders welded. Oversize Pistons and Rings furnished.

Emerson Manufacturing Co.

1075 Gratiot Ave.

Detroit, Michigan

CYLINDERS REGROUND

Oversize pistons, rings and hardened and ground piston pins. All cylinders ground on Heald grinders.

Send it to

COLUMBUS, OHIO

LITTER'S MOTOR MACHINE SHOP

240 North 4th Street

CYLINDER REBORING

FOR PASSENGER CARS—TRUCKS—TRACTORS
We have the capacity and the skilled workmen. Satisfaction guaranteed. "ONCE A CUSTOMER—ALWAYS A CUSTOMER" is our motto. We are also specialists in high grade PISTONS, RINGS and PINS. Special attention given to Trucks and Tractors.

PARK MACHINE CO.

22 West 3rd Street

ST. PAUL, MINN.

CYLINDERS REGROUND

\$5 to \$10 per cylinder. All our work guaranteed. Rings. Alloy pistons, from \$1.50 to \$3.50 per cylinder, extra. Ford cylinders reground and fitted with pistons, rings, wrist-pins and bushings.

Racing Motors a Specialty

D. R. NOONAN

Paris, Illinois

When Writing to Advertisers Please Mention Motor Age

CYLINDERS

REBORED or REGROUND

FITTED WITH NEW PISTONS AND RINGS

Satisfaction Guaranteed.

HOPE MACHINE CO.

2312 North 2nd Street. Philadelphia, Pa.

All Parts Duplicated

Cylinders Reground. General Machine Work for Foreign and American Cars. Welding of All Metals. Manufacturers of CATELAIN HOSE COUPLING. Ever-Ready Starters. U. S. Shock Eliminators. QUICK SERVICE; SATISFACTION GUARANTEED

ANDRE CATELAIN

1446-8 Indiana Ave.

CHICAGO, ILL.

CYLINDER GRINDING

Manufacturing of oversize Pistons, and Wrist Pins, for all makes of Cars, Trucks and Tractors. All work guaranteed. Best workmanship.

Send for Our Price List

MILWAUKEE CYLINDER GRINDING CO.

Humboldt & Concordia Ave., Milwaukee, Wis.

Cylinder Reboring

Welding and General Machine Work

We are especially equipped

to handle the above lines

and guarantee satisfaction.

Prompt Service Expert Workmanship

OLSON & DETLIE CO.

219-25 W. 7th St. Sioux Falls, S. D.

Expert Cylinder Grinding

Oversize and standard pistons, rings and wrist pins. We use our famous Double Lap Joint piston rings. Scored and cracked cylinders repaired. Work guaranteed.

WOODRUFF ENGINEERING CO.

5315 Euclid Avenue

Cleveland, Ohio

C RANK SHAFTS REGROUND NOT FILED AND LAPPED—BUT REGROUND ON SPECIAL GRINDERS CYLINDERS REGROUND

STAFFORD SUPREME SERVICE

STAFFORD MOTOR COMPANY

2201-09 Campbell Avenue Kansas City, Mo.

We specialize on the REBORING of cylinders and the

WELDING

of parts—both light and heavy. No job too small! None too large! Quick service and good service. WRITE US NOW.

BRUNKER MACHINE SHOP

232 South Water St. WICHITA, KANSAS

CYLINDERS REGROUND

Piston Rings and Wrist Pins Fitted. Machine work of all descriptions.

DELCO IGNITION SPECIALISTS

WM. BENDER

1829 Indiana Avenue

Chicago, Ill.

CYLINDERS REGROUND

including new pistons and rings. Any size up to 5-inch bore—\$5 to \$10 per cylinder. All our work guaranteed. Quick shipments. Let us prove our ability on your next job.

NEUPERT MFG. COMPANY

82 Lark Street

Buffalo, N. Y.

Cylinder Grinding

TRY US! We are especially equipped to handle practically all kinds of regrinding, fitting with new pistons, pins, and rings if desired.

Satisfaction Guaranteed—Prompt Service
APPLETON ENGINE WORKS
580 Superior Street APPLETON, WIS.

**WELDING
OF ALL METALS**

Scored Cylinders Repaired
CYLINDERS REGROUND—PISTONS FITTED
Ask about our guarantee.
A. PONDELICK, 226 S. Winchester Ave., Chicago

Cylinders Reground

Pistons, Rings, Wrist Pins, Fitted
Gear Cutting of All Kinds
Magnetos Parts and Repairing
Official Sims-Huff Service Station
E. H. ODOM BROTHERS COMPANY
19 James St. ATLANTA, GA.

EXPERT REBORING

of Cylinders and Welding of Broken Parts constitutes our main business. On badly scored cylinders we use old pistons by putting sleeve in cylinder. We maintain one of the largest and best equipped plants in the West for this work. Try us for real satisfaction.

STANDARD WELDING & MACHINE CO.
416-418 East Second St. Des Moines, Iowa

WE GRIND

Cylinders and fit special heat-treated Pistons. Welding of all kinds of Metals. Gear Cutting of all kinds. Scored Cylinders Repaired and Guaranteed for the Life of the Motor.

PONDELICK BROS.
Largest Mfrs. of Duplicate Auto Parts in U. S.
Leavitt St. & Jackson Blvd. Chicago, Ill.

Anything Electrical Repaired

ON YOUR AUTO

"At Prices You Will Be Glad to Pay"

"QUICKER SERVICE"

DETROIT MAGNETO EXCHANGE

188 Grand River Avenue

DETROIT, MICH.

ELECTRIC SPECIALISTS

Starters, Generators, Magnetos, Coils, Cutouts and Armature rewinding. Parts and Units in stock. 24-hour service. Chicago Distributors for Prest-O-Lite Batteries, Gas Tanks and Appliances. Dept A

Dept.
"A"

Automotive Electric Service Corp.

116-18 East 33rd Blvd., Chicago, Ill.

WE CAN FIX IT

IF IT'S ELECTRICAL

WE CAN FIX IT

FACTORY SERVICE—GENUINE PARTS—EXPERT REPAIRS
Westinghouse—Connecticut—K W Magnetos—Dyneto—Philbrin—Jesse—Berling Magnetos—Heinze Ford Starters—Norma Bearings—Waltham and Van Sicklen Speedometers—Bendix Drives—Philadelphia Batteries, etc.

ARTHUR JONES ELECTRIC COMPANY

2837 South State Street

Established 1903

CHICAGO

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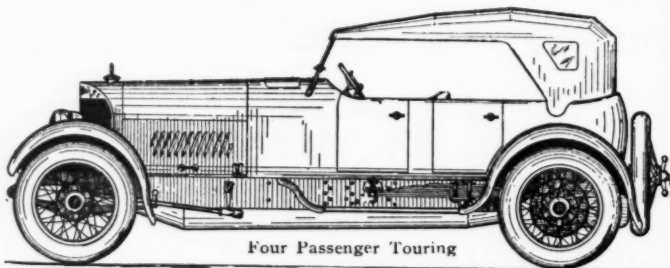
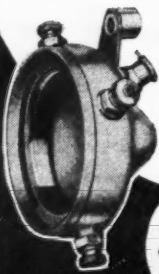
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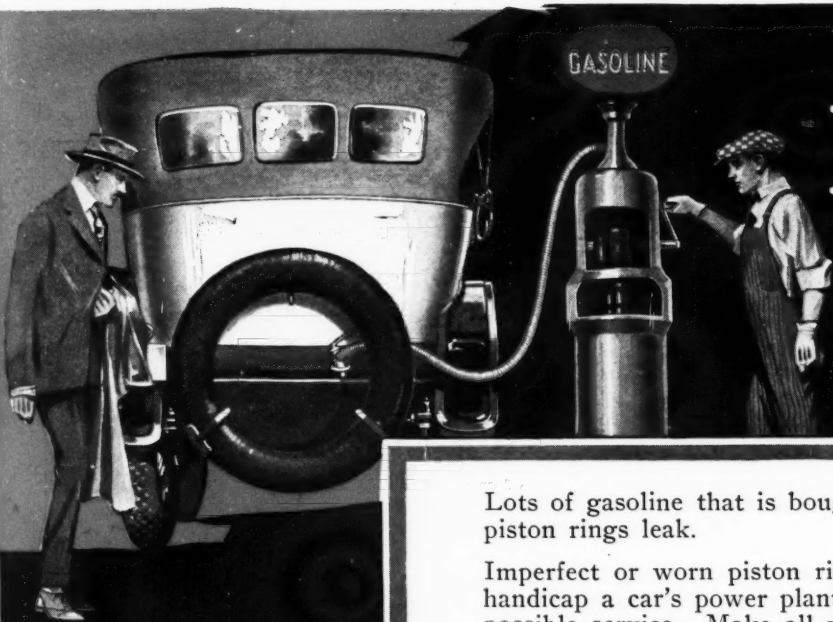
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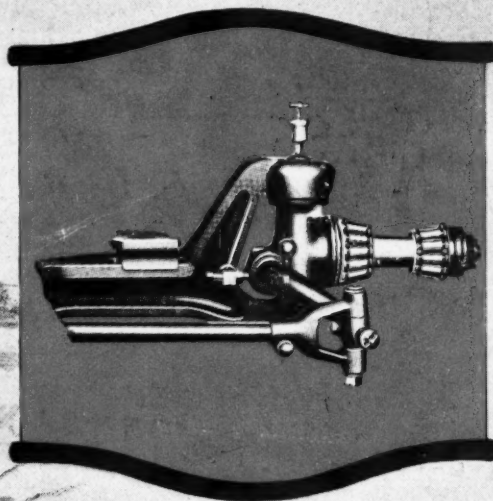
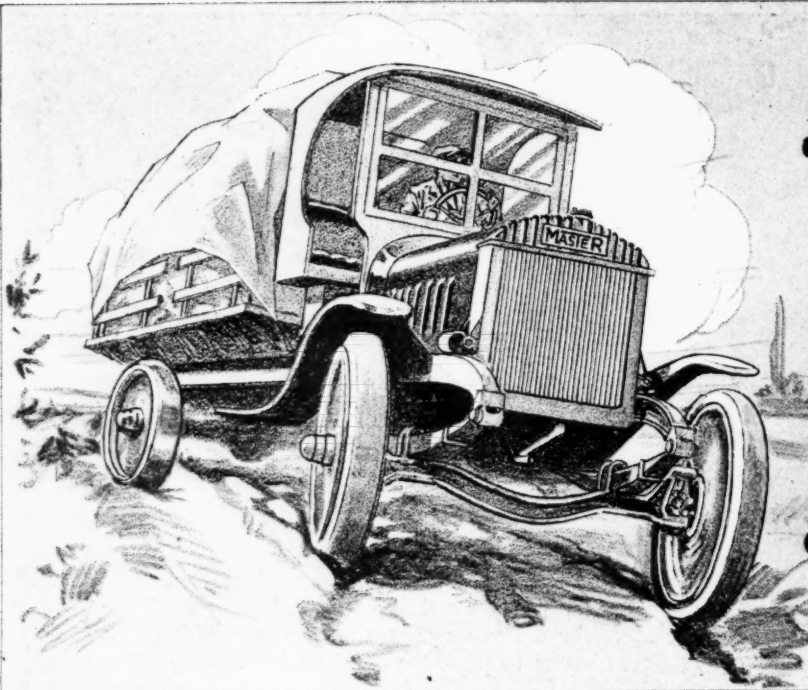
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McQUAY-NORRIS

**Superoyl
RINGS**

used in the top groove of each piston correct this condition. In the lower grooves McQuay-Norris **LEAK-PROOF** Piston Rings should always be used to obtain full compression—power. Fully explained in the free book mentioned.



balanced oversize

THE peculiar "twist" shown by the illustration above would put an overbearing strain on even the best made truck of conventional construction, but *not* on the "BALANCED OVERSIZE" MASTER TRUCK.

The endurance and *strain-absorbing* power of the MASTER is due to this special engineering feature of "BALANCED OVERSIZE," by means of which unusual strength and size are secured without resulting UNEVEN WEAR on the SMALLER PARTS.

Perfect balance—harmonious working of ALL parts—the weakness of NONE—make THIS truck "MASTER OF THE LOAD ON ANY ROAD;" a safe truck to buy—a safe truck to sell.

Mud, sand or hills look alike to the MASTER TRUCK. It's built to go, AND DOES IT! No strain or stress can make it less than the Super-Truck it is—the truck that answers all the "WHYS"—because of "BALANCED OVERSIZE."

Your territory may be open. Write or wire for our proposition to dealers

11 Models in 6 Sizes—1½ to 6 tons

MASTER TRUCKS, Inc. 3132-3138 S. Wabash Ave., Chicago, Ill.



MASTER OF THE LOAD ON ANY ROAD